SELF-REPORTED PERCEPTIONS OF FACTORS INFLUENCING ERROR REPORTING IN ONE NIGERIAN HOSPITAL: A DESCRIPTIVE CROSS-SECTIONAL STUDY

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SUBMITTED TO THE UNIVERSITY OF CAPE TOWN

In fulfilment of the requirements for the degree

MASTER OF SCIENCE IN NURSING

DIVISION OF NURSING AND MIDWIFERY

Department of Health and Rehabilitation Sciences

Faculty of Health Sciences

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Date of submission: 27th November, 2017

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DEDICATION

This research is dedicated first and foremost to God Almighty my present help in ages past and my hope for brighter days who granted me the opportunity to start and complete this project. Secondly, this project is dedicated to my late mother who left us a few months before the completion of this work. Finally to all patients who have died as a result of healthcare errors.

ACKNOWLEDGEMENTS

Eternity is too short to render all my praises to God Almighty the ancient of days, the one who was, who is and who is to come for sparing my life throughout this academic pursuit and for making this work a reality. This dissertation is made possible through the voluntary efforts of the following people without whose assistance the work would not have been in existence. I extend grateful thanks to:

- **Supervisor:**

Associate Professor Una Kyriacos, for your endless patience, vast experience and free-hearted time devoted to supervise this research work to completion, May God honour you in all your endeavours.

- **Sponsor:**

My husband and the National Research Foundation for your generosity.

- **Participants:**

Clinicians and research experts who devoted their time despite busy work schedules to validate the questionnaire used for the study.

All nurses and doctors who took the time to respond to the call to participate in the research.

Hospital management teams for displaying willingness to take part in the study.

- **Family:**

My husband, Oladele, for your unconditional love, understanding, patience, guidance through this journey and for keeping a watchful eye over the entire process. You are the best and I am eternally grateful.

My children for making many sacrifices with cooperation, I love you. I cannot but pay homage to the best parents in the Universe (Chief and Mrs. M.A Afolalu and the Late Mrs. M.B Olufemi) who took care of my kids while l was away for this study and for ensuring that the seed planted in their custody is germinating and bringing forth fruit. God will reward you for good. My sincere gratitude to all my brothers and wonderful sister-in-law for their time, friendliness and ongoing support granted to me. I also extend grateful thanks to Dr. & Mrs. O.J Oluwasuyi and Honourable & Mrs. Adebayo, Mr Seun Olufemi & Mrs Durojaiye for their prayers and support so far. God bless you all.

ABSTRACT

Background: Over the past decade the concern about patient safety due to the occurrence of medical errors has become a priority in healthcare. Medical errors occur from virtually all processes in the delivery of healthcare and while most have little risk for patient harm, some do result in injury, increased health care cost, lost income, decreased productivity, disability, morbidity and mortality. Under-reporting of medical errors is a global issue endangering patient safety and compromising health outcomes. Awareness and use of a hospital's error reporting system is an initial step towards improved reporting rates.

Aim: The aim of the study was to describe doctors' and nurses' self-reported perceptions of factors influencing error reporting in a Nigerian hospital by survey questionnaire.

Methods: This study employed a descriptive cross-sectional design to survey a random sample of 230 health professionals (n=90 doctors, n=130 nurses) working in all the units and departments of a Nigerian tertiary health institution. A theoretical model of a health information technology framework with implications for patient safety served as a guide for the literature review and interpretation of study findings. A 47-item self-administered survey questionnaire served as the data collection instrument. The questionnaire was developed following the review of available published literature and validated by four experts (n=2 doctors, 2 nurses), who determined the index of content validity. Inter-rater reliability of the instrument was subsequently measured by test-retest reliability of data from a pilot study of 30 raters (n=13 doctors, n=17 nurses). The validated questionnaire was used to determine doctors' and nurses' awareness and use of an error reporting system, frequency of reporting various types of errors, perceived barriers to error reporting and factors that facilitate an error reporting culture. Data collection took place for four weeks in February 2017. Data were analyzed in SPSS using descriptive and inferential statistics.

Results: The median age of the respondents was 36 years (range of 25-59). The typical nurse respondent was female having a diploma in nursing and no Master's degree or PhD, in contrast to the doctors, most of whom were male and a few had a postgraduate qualification. The gender difference between the two groups was statistically significant (P<0.001). The majority of the respondents had 6-10 years of work experience and were in full-time employment and the difference in current work status (P=0.001) and years of work experience (P<0.001) between the two groups was statistically significant.

Awareness of error reporting system: most respondents disagreed that the hospital had a system in place for reporting errors but more nurses (56/140, 40.0%) than doctors (16/90, 17.8%) were aware of such a system and the difference in responses between the two groups achieved statistical significance (X^2(4,

n=230) = 13.302, P<0.010); knew where and when to report errors (nurses 48.6%, n=68/140; doctors 20.0%, n=18/90) (X^2(n=230) = 23.843, P<0.001); how to locate an incident form (nurses n=60/139, 43.2%; doctors n=28/89, 31.5%) (X^2(4, n=228) = 9.842, P=0.043); and who to report an incident or error to (nurses n=72/140, 51.4%; doctors n=33/90, 36.7%) (X^2(4, n=230) = 11.845, P=0.019). Results for type and frequency of errors reported and factors facilitating an error reporting culture did not achieve statistical significance.

Perceptions of barriers to error reporting: lack of confidentiality (nurses n=62/140, 44.3%; doctors n=27/87, 31.0%) (X^2(n=227) = 11.697, P=0.019). Most respondents were unsure if error reporting forms were easy to complete (nurses n=49/137, 35.8%; doctors n=26/88, 29.5%), (X^2(4, n=225) = 9.926, P=0.042). Factors not perceived as barriers: positive feedback when reporting errors (nurses n=61/140, 43.6%; doctors n=24/90, 26.7%), (X^2(n=230) = 10.939, P=0.026); reporting an error that did not cause harm (doctors n=40/90, 44.4%; nurses n=50/139, 36.0%), (X^2(4, n=229) = 9.618, P=0.047); time involved in reporting (nurses n=76/138, 55.1%; doctors n=26/89, 29.2%), (X^2(4, n=227) = 17.327); and learning from the error (doctors n=42/90, 46.7%; nurses n=40/138, 29.0%), (X^2(4, n=228) = 20.777, P<0.001)

Conclusion: Doctors and nurses were mostly unaware of the hospital's error reporting system which can be concluded to be an organizational factor. Respondents would be willing to report incidents if perceived barriers are removed. There is an urgent need for an effective error reporting system to be implemented in the local setting and for appropriate awareness training and educational interventions to improve doctors' and nurses' knowledge and use of medical error reporting.

Relevance to clinical practice. Effective error reporting systems in the Nigerian healthcare sector that improve awareness and use of these systems should enhance a reporting culture and thereby improve patient safety.

Keywords. Patient safety, error reporting, medical errors, healthcare professionals, knowledge, barriers, facilitate.

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Abbreviations

ADR: Adverse drug reporting

AHRQ: Agency for Healthcare Research & Quality

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AIDS: Acquired Immune Deficiency Syndrome

BNSC: Bachelor of Nursing Science

CBR: Computer-Based Reporting system

CDC: Centre for disease control and prevention

COE: Computerized Order Entry

CANE: Communicating about Nursing Errors

CVI: Index of content validity

DPSI: Disclosure of patient safety incidents

ED: Emergency department

EM: Emergency medicine

EMER: Emergency Medicine Events Register

EMTs: Emergency medical technicians

EPI: Epidemiology

ER: Error reporting

ERC: Error reporting culture

ERP: Error reporting practice

ERS: Error reporting system

EUNetPAS: European Network for Patient Safety

FETHI: Federal Teaching Hospital Ido-Ekiti

HIT: Health Information Technology

ICU: Intensive Care Unit

IOH: Institute of Medicine

IRR: Inter rater reliability

IRS: Incident reporting system

KAPs: Knowledge, attitude and practice

LIS: Laboratory Information Systems

MAEs: Medication Administration errors

MBBS: Bachelor of Medicine, Bachelor of Surgery

MD: Doctor of Medicine

MOD: Doctor of Medicine

NPRF: Nigerian Professional Regulatory Source

NHS: National Health System

NHs: Nursing homes

NQF: National Quality Forum

OVR: Occurrence Variance Reporting System

PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses

RIS: Radiology Information Systems

SPSS: Statistical Package for the Social Sciences

SSHA: State Specialist Hospital Asubiaro

STROBE: Strengthening the Reporting of Observational Studies in Epidemiology

USA: United States of America

WHO: World Health Organization

Operational definitions

Adverse events: an injury that originates from medical management (rather than the underlying disease) which causes life-threatening illness, death, prolongs hospitalization, produces a disability at the time of discharge, or both and can be preventable or not preventable (Garrouste-Orgeas et al., 2012, p. 2; Kohn, Corrigan, & Donaldson, 2000).

Error reporting: refers to communication of healthcare errors (verbal, written, or otherwise and/or recording of near misses and patient safety events that generally involves some form of reporting systems). Disclosure of these events may involve communication of errors to patients and their families, including the ethical aspects of error-reporting systems (Wolf & Hughes, 2008a, pp. 2-233).

Barriers: In the context of this study are perceived factors which restrict the free will of healthcare professionals to report an error and/or adverse event.

Facilitate: In the context of this study refers to perceived measures and factors that make it possible or easier to report a medical error and/or adverse event.

Perception: the state of being or process of becoming aware of something through the senses or intuitive understanding and insight.

Medical error: an unintended healthcare outcome caused by a defect in the delivery of care to a patient. Garbutt et al. (2008, p. 249) defined an error as the failure of a planned sequence of mental or physical activities to achieve its intended outcome when these failures cannot be attributed to chance. Errors are an inevitable and unfortunate reality of medical practice and can include serious errors, minor errors, and near misses involving diagnostic, medication errors and others (Handler et al., 2007a, p. 2; Kuo, Touchette, & Marinac, 2013).

Patient safety: means freedom from accidental injury and elimination of patient injury caused by error (Garrouste-Orgeas et al., 2012, p. 2).

Near miss: an adverse event that either resolves spontaneously or is neutralized by voluntary action before the consequences arise. Adverse events may be due to medical errors, in which case they are preventable, or to factors that are not preventable (Garrouste-Orgeas et al., 2012). It is described as an error that could have caused harm but did not, either by chance or because of timely intervention (Garbutt et al., 2008).

Serious errors: are errors that cause permanent injury or transient but potentially life-threatening harm (Kohn et al., 2000). It is an event that can result in death, loss of a body part, disability, loss of bodily function, or requires major intervention for correction (such as a higher level of care or surgery) (National Quality Forum (NQF), 2011, pp. B-4).

Minor errors: These are errors that cause harm that is neither permanent nor potentially life threatening (Kohn et al., 2000).

Patient outcome: can be defined as the results of care in terms of patients' health over time or it is the results people care about most when seeking treatment, including functional improvement and the ability to live a normal, productive life (Hansson, Kohler, Skarsgård, & Larsso, 2015).

General Definitions

Inter-rater Reliability: is the reliability of measurements made by clinicians which indicate the extent to which clinicians agree in their ratings, not merely the extent to which their ratings are associated or correlated. It is an agreement between ratings made by 2 or more clinicians (Julius & Wright, 2005, p. 258).

Content Validity Index (CVI): is a computational procedure for the scale-level CVI referred to as 'the proportion of items given a rating of 3 or 4 by both raters involved'' (Polit & Beck, 2006, p. 491).

CHAPTER ONE

INTRODUCTION

Over a decade ago, the concern for patient safety became a priority issue in health care due to the occurrence of medical errors (Poorolajal, Rezaie, & Aghighi, 2015). Medical errors occur from virtually all processes involved in the delivery of health care and while most have little risk for patient harm, some do result in injury. Statistics have shown that globally in 2013 an estimated 142,000 people died from adverse effects of medical treatment reflecting an increase from 94,000 in 1990 (Abubakar, Simbak, & Haque, 2014). A similar study showed that medical errors affect 2–14% of all hospital inpatients, and result in 7000 and 13,500 deaths in the United States of America (USA) and the United Kingdom (UK) each year respectively (Williams., Manwell, Konrad, & Linzer, 2007). Issues such as staffing limitations and high turnover rates increase the risk substantially (Green, Tsiroyannis, & Brennan, 2016). Despite the increase in these errors with associated morbidity and mortality rates, poor reporting practice among health professionals persists (Garbutt et al., 2008; Kim, An, Kim, & Yoon, 2007).

In healthcare systems, health professionals such as doctors and nurses form an essential part of the workforce with the principal goal of advancing and promoting health. Guilbert (2006) described health professionals as all people primarily engaged in actions with the primary intent of enhancing health. Generally, doctors and nurses attempt in their day-to-day practice to provide optimal care for patients and clients and to ensure that they are free from any injury or harm. This is made possible through delivery of patient-centered care encompassing holistic care but numerous challenges affect clinical judgement and skills. Importantly among the challenges experienced is the occurrence of medical errors which are described as inevitable events in the health sector (Hung, Chu, Lee, & Hsiao, 2016; Smith et al., 2014).

Medical errors are serious public health problems endangering patient safety in health care and are found to be underreported by health professionals in many health institutions (Greene, Williams, Pierson, Hansen, & Carey, 2010). A significant cause of these errors that are detrimental to patients usually result from both individual clinicians and their health institutions, resulting in lack of the community's trust in health providers and their institutions as well as adverse consequences for patients (Green et al., 2016). Although clinicians do not want to intentionally harm patients; when they conceal errors, they place patients at increased risk of some type of harm. At a regional level error reporting is also a problem in Nigeria.

1.1 Background

Patient safety implies freedom from accidental injury and elimination of patient injury caused by error (Garrouste-Orgeas et al., 2012, p. 2) or occurring as a result of unexpected adverse events of health care processes (Bahadori et al., 2013). Patient safety remains a priority issue for every health care system as it entails one of its main goals (Westat et al., 2010). Safety concerns, adverse events and near misses occurring within work situations if reported, provides room for improvement. Error reporting is therefore one type of safety information system that must be adopted to promote health and well-being of healthcare clients.

1.1.1 The Nigerian situation

Nwozichi (2015) attributed poor error reporting practice ravaging the Nigerian health sector to lack of effective systems for tracking errors unlike the developed countries of the world. This finding was corroborated by Ayodele in 2011 who reported that Nigeria lacks a system for communicating information between and among employers and staff. In Nigerian hospitals, hospital information systems including strategic decision support systems and clinical support systems such as documentation, Laboratory Information Systems (LIS), Radiology Information Systems (RIS), Computerized Order Entry (COE) and Telemedicine (the more advanced technology) are lacking. Similarly, anecdotal reports show that incident reporting system seemed to be lacking at the Federal teaching hospital, Ido-Ekiti (FETHI). It seems that errors are reported orally by the head of each nursing unit/department and chief consultants to the chief nursing officer and chief medical director of the hospital.

Lack of efficient and effective hospital reporting systems in Nigeria make highly influential societal members lose trust in the health system and seek health services or embark on medical tourism in advanced countries of the world, while the poor populace face the risk of being endangered by error (Ayodele (2011). Ayodele (2011); Okeke (2008) reported that poor access to modern medical healthcare facilities has compelled many Nigerian patients to seek treatment with traditional healers and patent medicine dealers. In addition, there is a paucity of published literature on nurses' reporting of medication administration errors in Nigerian healthcare systems (Nwozichi, 2015; Oshikoya et al., 2013). Specifically, there is no known literature that deals with nurses and doctors' perceptions of factors influencing the practice of error reporting.

1.1.2 Factors contributing to error occurrence

Error occurrence resulting in patient harm is attributed to a number of factors: personal, organizational and situational as reported by hospital employers or healthcare organizations (Green et al., 2016). Tiredness and fatigue, nutritional status, the effect of negative emotions such as stress and anger are important personal factors that can result in error on the part of a health professional, while inadequate personnel were identified as an essential cause of error in organization factors (Green et al., 2016). To reduce or prevent physical and psychological harm in healthcare, it is imperative that error situations and resulting factors are identified.

1.1.3 Under-reporting of medical errors

Under-reporting is a problem that plagues the health system and occurs all over the world (Yung, Yu, Chu, Hou, & Tang, 2016a). A cross-sectional study of five hospitals in Iran showed a high incidence rate of medical errors committed among the study respondents with a low reporting rate (50.26%) (Poorolajal et al., 2015). However, despite the high rate of errors in health care, about 95% of incidents of adverse drug reporting go undocumented worldwide (Abubakar et al., 2014; Nwozichi, 2015). This has resulted in a dearth of information on adverse events and incident reporting in developing countries like Nigeria (Nwozichi, 2015), whereas reporting is a strategy that promotes learning from error situations (Yung, Yu, Chu, Hou, & Tang, 2016c).

Another study involving nurses showed that a gap exists between the actual rate of medication errors and the reporting rate of nurses (Bayazidi, Zarezadeh, Zamanzadeh, & Parvan, 2012). A three month study conducted on 286 nurses in Iran showed that most of the study respondents reported making and reporting zero errors, while only a small number of respondents made up to 40 errors of certain types and reported up to 20 errors (Hajibabaee et al., 2014). In this study only 1.3% of 19.5% of medication errors occurring in hospitals was reported (Hajibabaee et al., 2014). The majority of health professionals prefer to make oral or verbal reports than to complete formal documentation (Holden & Karsh, 2007; Wolf & Hughes, 2008b). Unfortunately, without formal reports, patient-safety improvement opportunities are jeopardized and not achievable (Yung et al., 2016c). The majority of studies conducted in low and middle income countries have focused on identifying the causes of medical errors rather than the barriers to reporting errors (Bahadori et al., 2013; Bayazidi et al., 2012; Poorolajal et al., 2015). Thus, a number of factors point to the reasons why doctors and nurses fail to report.

Some researchers have explored factors mitigating health professionals' willingness to disclose errors: the design or nature of reporting system, culture of the hospital or unit or department, and fear of consequences (Wolf & Hughes, 2008b; Yung et al., 2016a). A study conducted by Nwozichi (2015) on oncology nurses in a Nigerian hospital revealed that 89.8% made at least one medication administration error (MAE) in the course of their professional practice but fear of being reprimanded, system failure and poor managerial response were associated barriers to MAE reporting. Similarly, a study conducted among physicians by Shaibu and Muhammad (2011) in Sokoto Nigeria, showed that 43 of 61 (70.5%) had encountered potential adverse drug reporting (ADR) in the last 12 months before the study but only 3/43 (7%) of these errors were reported. The low reporting rate was associated with lack of awareness of the existence of the hospital's error reporting system.

1.1.4 Barriers to error reporting culture

Many health institutions lack a system of reporting incidents and are faced with little or no knowledge of error occurrence (Holden & Karsh, 2007; Poorolajal et al., 2015). Similarly, the few institutions with a reporting system in place make inadequate use of it. This has resulted in little or no knowledge of the occurrence of errors within such organizations. Other factors identified in recent studies that serve as barriers to making reports include the time-consuming process of writing a report and the additional tasks associated with reporting the incident (Hung et al., 2016; Yung et al., 2016a). In addition, the fear of punishment or being considered unprofessional, peer pressure and an unsupportive work environment and fear of exposure to malpractice suits are other barriers (Holden & Karsh, 2007; Yung et al., 2016a). Ultimately, work environment conditions such as inadequate provision and allocation of the workforce and lack of support from supervisors and administrators was identified as the leading barriers (Hartnell, MacKinnon, Sketris, & Fleming, 2012; Holden & Karsh, 2007).

1.1.5 Consequences of medical errors

With increasing rates of errors in health systems and significant under-reporting, patients are put at risk of significant harm. Medical errors remain an important cause of increased healthcare costs for patients, lost income, decreased productivity, disability, morbidity and mortality (Abubakar et al., 2014; Karlsen, Hendrix, & O'Malley, 2009). Importantly, temporary or permanent disabilities or death of patients and a long-term effect on the patient's family are other effects of error on patients (Ali, Khamis, & Salim, 2013).

A medical error, based on its severity can also lead to devastating effects on the healthcare provider. According to Smith et al. (2014), the consequences of reporting medical errors for healthcare workers are

broad and complex. Ethically, it is appropriate and expected that medical errors should be reported promptly and honestly by health providers irrespective of the consequences they may face (Bahadori et al., 2013; Wolf & Hughes, 2008b) although the emotional distress of disclosure can leave health providers feeling upset, guilty, self-critical, depressed and anxious (Smith et al., 2014). In addition, healthcare providers may face job sanctions and are at risk of malpractice litigation (Garbutt et al., 2008; Smith et al., 2014; Waterman et al., 2007). However, the effect of reporting on healthcare providers poses less risk of harm than to patients, hospitals and the society at large.

1.1.6 Origin of medical error reporting systems

In order to reduce the occurrence and the cumulative consequences of medical errors in healthcare, an error reporting system was established in line with the IOM report of 1999 (Wolf & Hughes, 2008b). The concept of error reporting involves communication of healthcare errors (verbal, written, or otherwise) and/or recording of near misses and patient safety events that generally involves some form of reporting system (Wolf & Hughes, 2008a). In addition, Smith et al. (2014) defined a reporting system as a strategy designed to identify error, learn from error and prevent future recurrence. Apparently, a number of systems for reporting errors have been developed, instituted and implemented in healthcare with much emphasis on voluntary and mandatory reporting systems (Wolf & Hughes, 2008b). However, medical error was hardly mentioned in the medical literature some twenty years ago let alone discussed publicly (Vincent, 2012) but the publication of the IOM report of 1999 has increased the desirability of various individuals, organizations and societies to learn from errors (Kohn et al., 2000).

Incident reporting enables healthcare providers to make honest reports of incidents and to learn from such errors. This approach has been helpful in ensuring patient safety and improved healthcare quality in hospitals. From 1999 to date, numerous studies have been conducted on patient safety, error reporting and adverse events. Currently, different health organizations, employers and professional bodies have begun to intensify efforts in ensuring a safe health environment through the establishment of different reporting systems for hospitals (Jewell & McGiffert, 2009). Voluntary, mandatory, anonymous and computerized forms of reporting systems have been developed across the world in addition to formal and informal methods of reporting (Yung et al., 2016; Karlsen et al., 2009; Wolf & Hughes; Smith, 2014). Contrary to the formal method of reporting errors is the informal method of reporting that most health professionals resolve to use as a result of inefficiency in certain hospital's error reporting systems and fear of legal action (Holden & Karsh, 2007). However, few hospitals have adopted a well-known reporting system which has contributed to the poor reporting rate (Jewell & McGiffert, 2009).

On the other hand, a national reporting system of accountability as recommended by the IOM has not been established in most countries of the world (Jewell & McGiffert, 2009). A national system provides external means for reporting and tracking errors and is designed to recommend excellent practice methods for all healthcare (Kohn et al., 2000). Medical error reporting does not appear to have improved in many countries of the world including Nigeria (Ogundiran & Adebamowo, 2012) despite the importance of reporting as a leading initiative to enhanced patient safety and reduced harm to patients and clients in healthcare (Holden & Karsh, 2007). Therefore, a well-structured internal and external or national reporting system is needed to foster a reporting practice among health professionals. Such a system must provide information on how and what to report (Hung et al., 2016; Smith et al., 2014).

1.1.7 Importance of reporting systems

In this regard, it is imperative that healthcare organizations should be a learning environment to build and maintain a culture of safety. The system should be designed to promote health, prevent complications and improve patient healthcare outcomes (Holden & Karsh, 2007). Error reporting should be confidential and without fear of blame (Bahadori et al., 2013). Information on the cause and outcome of failures reported can be fed back so that learning from errors prevents repetition in more serious situations. Greater openness with patients about harmful errors is also recommended as a factor that will build patients' trust in the care process (Garbutt et al., 2008).

An integrated model of HIT usage behaviour framework developed by Holden and Karsh (2009) (Chapter 2; figure 2.10.4) was designed with the goal of providing an integrative framework for testing hypotheses about how barriers and incentives influence an error reporting system. The design of the present study has been guided by the work of Holden and Karsh and seeks to identify and describe the factors influencing medical error reporting in a Nigerian hospital. Identification of these factors will go a long way in encouraging patient safety event reporting as a method to enhancing patients' overall health outcomes. Complete and honest disclosure of medical errors not only strengthens patient trust in the medical system but also facilitates identification of substandard care and improvement of care systems (Wolf & Hughes, 2008b).

1.2 Problem statement

Medical errors occur from virtually all processes involved in the delivery of healthcare and while most have little risk for patient harm, some result in injury, increased healthcare cost, lost income, decreased

productivity, disability, morbidity and mortality (Abubakar et al., 2014). There is evidence of poor error reporting in healthcare with limited information on barriers to error reporting or methods to overcome these barriers successfully (Yung et al., 2016c) particularly from Nigeria. Therefore, this study will serve to identify doctors' and nurses' knowledge and use of an error reporting system, their practice of error reporting, as well as factors influencing error reporting in one Nigerian hospital with a view to improving patient safety and increasing public trust in the health system.

1.3 Research question

What are the self-reported perceptions of doctors and nurses regarding factors influencing medical error reporting at the Federal University Teaching Hospital, Ido-Ekiti in Ekiti-State, Nigeria?

1.4 Aim

The aim of the study was to describe doctors' and nurses' self-reported perceptions of factors influencing error reporting in a Nigerian hospital by survey questionnaire.

1.5 Objectives

The objectives of the study were to:

1.5.1 identify and compare socio-demographic characteristics of doctors and nurses (age, gender, years of experience, educational level and current work status);

1.5.2 describe and compare doctors' and nurses' self-reported level of awareness and use of an error reporting system (Section B part of the questionnaire);

1.5.3 describe and compare the frequency of reporting various types of errors occurring in healthcare among doctors and nurses (Section C of the questionnaire);

1.5.4 describe and compare doctors' and nurses' perceptions of factors that serve as barriers to error reporting (Section D of the questionnaire);

1.5.5 describe and compare doctors' and nurses' perceptions of factors that facilitate an error reporting culture at the hospital (Section E of the questionnaire).

1.6 Significance of the study

The intention of this study was to provide information on attitudes and factors that are perceived barriers to error reporting in hospitals and perceived factors that promote error reporting. Study results may contribute to the growing body of knowledge regarding effective work environments in hospital settings particularly regarding the link to objective measures of care-sensitive patient outcomes. The results may enable the development of a prompt and efficient error reporting culture among health professionals. Future researchers may use this study as a reference and guide for future studies on error reporting. The study findings may also assist with system redesign to reduce or eliminate barriers to reporting errors and embrace factors that will facilitate error reporting to promote patient safety.

1.7 Introduction to conceptual framework which guided the study

A theoretical framework is useful to develop studies and study questions in a principled way, providing guidance for selecting variables of interest and formulating research hypotheses (Grant & Osanloo, 2014). *A priori* hypothesis generation might avoid a number of methodological and statistical biases, thus reducing the likelihood of spurious findings (Holden & Karsh, 2009). For the purpose of this study, Holden and Karsh's theoretical model of health information technology usage behavior with implications for patient safety was used to interpret the findings of this study (Chapter 2).

1.8 Summary

In this chapter the outline of the study was described against the background to error reporting and the problem of under-reporting of errors in the context of Nigerian hospitals. The aim of this study was to explore factors influencing error reporting practice among doctors and nurses in one of the teaching hospitals in South-west Nigeria through achievement of the stated study objectives.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This narrative literature review is aimed at providing insight into the work done by other researchers in the area of clinical error reporting and learning from such errors within Nigeria, other developing countries and the world at large. The published literature was reviewed critically and globally for keywords appearing in an initial review of the literature such as: medical errors, error reporting, type of reportable error, hospital error reporting systems, error reporting barriers and factors that facilitate error reporting. In addition, the available literature was searched for appropriate research methods to guide the study. Studies that used quantitative descriptive cross-sectional studies were searched more thoroughly but the review also considered other available research designs (quantitative, qualitative and mixed methods) relevant to the field of discourse.

2.2 Search strategy

For the narrative review, the published literature was searched using the keywords: medical errors, error reporting, error reporting barriers, and reporting systems. This involved a thorough, objective and reproducible search of a range of sources (within resource limits) to minimize selection bias (Higgins, 2011). The strategy included use of PubMed Medical Subject Headings (MeSH) terms: “medical errors” “disclosure” and “patient safety” that produced a result (Table 2-1), while the other keywords yielded no MESH results. Searches were conducted in seven electronic databases: PubMed, Cochrane, EBSCOhost, MEDLINE, CINAHL, PsycINFO and Africa-Wide Information using the Boolean operators “OR”, “AND” and the truncation ‘*’ as shown in Table 2-1.

Table 2-1: Literature search strategy and results

Database/Search Engine	Keywords and Phrases	Number of relevant papers	Number used
PubMed MESH	medical errors, disclosure and patient safety	6	3
EBSCOhost CINAHL	Error reporting OR disclosure AND Report* AND Medical errors OR medical mistakes OR adverse events AND Barriers OR Facilitat* AND Patient safety OR health outcome	93	16
EBSCOhost Medline		112	11
Africa-Wide Information		12	2
Pubmed		339	14
PsycINFO		42	4
Cochrane		0	0
Google Scholar		40	7
Total		644	57

Key

(*) used in Table 2-1 denotes truncation useful for finding all forms of words that are related to "Report"
"OR" is the Boolean operator used to find alternative terms for identified synonyms
"AND" is the Boolean operator used to link keywords.

Searches were performed separately in each database and included studies reported only in the English language where full texts were available in peer-reviewed journals and in books between the years 2007 and 2017. No grey literature was used such as conference papers, letters and editorial papers other than executive summaries and policy documents. It was found that most published studies had been conducted in resource-rich countries; there was a paucity of literature on error reporting from the developing countries with Low-Middle-Income economies such as Nigeria.

To identify additional relevant papers, appropriate references from eligible articles were hand searched, resulting in the inclusion of publications dated earlier than the stated search dates, such as the classic 1999 report "To Err Is Human: Building a Safer Health System" of The Quality of Health Care in America Committee of the Institute of Medicine (IOM), with a focus on medical errors. The final number of references at the conclusion of the study exceeded the number (n=93) found at the time of the literature search. Search strategies and results are tabulated in Table 2-1.

2.3 Results from the literature reviewed

A total of 644 publications were screened by their titles, abstract, full text, year of publication and relevance to key concepts or research title. Following this, 57 of 644 were found to be useful for inclusion in the

study. The hierarchy of evidence (Figure 2.1) shows that meta-analysis and systematic reviews are considered the most robust evidence, followed by randomized controlled trials (RCTs), cohort studies, case control and then cross-sectional studies.

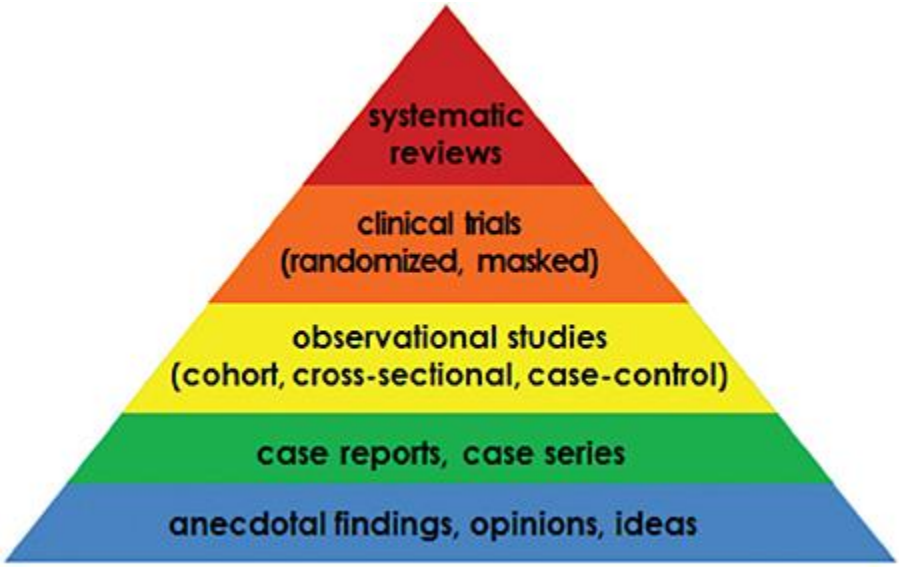

Figure 2-1: Hierarchy of evidence in clinical Research

(http://www.clspectrum.com/archive/2014/February/images/cls_feb_3701.jpg)

Table 2-2 distinctly presents the rating scales used in the JHNEBP process to evaluate the strength and quality of research evidence. The reviewed studies in Table 2-3 are presented by hierarchy of evidence.

Table 2-2: JHNEBP Evidence Strength Rating Scale

a. High	Scientific	Consistent results with sufficient sample size, adequate control, and definitive conclusions; consistent recommendations based on extensive literature review that includes thoughtful reference to scientific evidence.
	Summative reviews	Well-defined, reproducible search strategies; consistent results with sufficient numbers of well-defined studies; criteria-based evaluation of overall scientific strength and quality of included studies; definitive conclusions.
	Experiential	Expertise is clearly evident.
b. Good	Scientific	Reasonably consistent results, sufficient sample size, some control, with fairly definitive conclusions; reasonably consistent recommendations based on fairly comprehensive literature review that includes some reference to scientific evidence.
	Summative reviews	Reasonably thorough and appropriate search; reasonably consistent results with sufficient numbers of well-defined studies; evaluation of strengths and limitations of included studies; fairly definitive conclusions.
	Experiential	Expertise appears to be credible.
c. Low quality or major flaws	Scientific	Little evidence with inconsistent results, insufficient sample size; conclusions cannot be drawn.
	Summative reviews	Undefined, poorly defined, or limited search strategies; insufficient evidence with inconsistent results; conclusions cannot be drawn.
	Experiential	Expertise is not discernable or is dubious

Adapted from Poe and White (2010). Johns Hopkins nursing evidence-based practice: Implementation and translation: Sigma Theta Tau.

Table 2-3: Hierarchy of evidence of reviewed studies

Authors	Study aims/objectives	Outcome measures	Method and sample size	Findings	Study limitations	Evidence level
Systematic reviews						
Ock, Lim, Jo, and Lee (2017)	A systematic review to assess and aggregate the available evidence on the frequency, expected effects, ob-stacles, and facilitators of disclosure of patient safety incidents (DPSI) from 1990 to 2014.	Identify and discuss the frequency and effect of DPSI among medical professionals.	The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines for this systematic review was used. Two authors independently conducted the title screening and abstract review and 99 articles were selected for full-text reviews. One author extracted the data and another verified them.	Approximately half of the articles for the full-text reviews (n=53, 53.5%) were published from 2010 onward. Of the 99 articles, 75 provided information on the frequency of DPSI (key question 1), 33 articles included the expected effects of DPSI (key question 2), and 20 articles described the obstacles to and facilitators of DPSI (key question	Most of the articles selected for full-text review were from Western countries, it could be argued that the articles mainly reflected the cultural context of Western countries and failed to include researches from non-Western countries.	High
Brunsveld-Reinders, Arbous, De Vos, and De Jonge (2016)	A systematic review of incidents and error reporting systems in the intensive care unit conducted from 1966 to 2014.	Assess to what extent incident reporting systems (IRSs) on the adult intensive care unit (ICU) meet the criteria of the WHO Draft Guidelines for Adverse Event Reporting and Learning Systems	Two investigators identified 36 studies describing 23 different instruments for collecting and analyzing incidents.	A total of 2098 studies were identified and only 36 studies reported IRSs on the adult ICU. A total of 23 different IRSs have been used so far. Studies were divided into: ICU-specific IRSs and general IRSs. Items of the WHO checklist were assessed and categorized and it was observed that none of the IRSs completely fulfilled the WHO checklist criteria.	The literature review was limited by the qualitative nature of the included studies that made it impossible to quantify the data.	Good
Integrative literature reviews						
Perez et al. (2014)	A review of literature on the issues of medical errors and medical malpractice in order to establish transparency in health care.	Effects of the intrapersonal, interpersonal, institutional, and societal barriers to transparency	Methods: A review of the literature was carried out using the search terms ‘‘transparency,’’ ‘‘patient safety,’’ ‘‘disclosure,’’ ‘‘medical error,’’ ‘‘error reporting,’’ ‘‘medical malpractice,’’ ‘‘doctor-patient relationship,’’ and	A total of 67 articles were included in this review. From there, 4 domains of barriers were identified: intrapersonal, interpersonal, institutional, and societal. Overall, the findings of the review aligned with earlier studies that	Given that many of the studies were descriptive, a quantitative analysis was not undertaken.	Good

Authors	Study aims/objectives	Outcome measures	Method and sample size	Findings	Study limitations	Evidence level
		and error disclosure.	''physician'' to find articles describing physician barriers to transparency.	demonstrated the need for a comprehensive and multi-level approach to achieve a culture of transparency.		
Pre- and post-intervention studies						
Louis et al. (2016)	Improve the awareness and understanding of residents and physicians at TriHealth, Inc., a large, nonprofit independent academic medical center in Ohio regarding: (1) what constitutes a reportable patient safety event, (2) who is responsible for reporting, and (3) how to use the hospital's current reporting system.	Measured the effect of educational intervention on patient safety event reporting.	The quality improvement project was conducted from July 2014 to June 2015. The participants were 105 residents and 78 teaching faculty from Family medicine, internal medicine, obstetrics and gynecology in the setting. An anonymous questionnaire assessing physicians' and residents' attitudes and experience regarding patient safety event reporting was developed. Comparison of the pre-intervention and post-intervention questionnaires was done.	Results: The number of patient safety event reports increased following the educational intervention; however, we saw wide variability in reporting per month. On the post intervention questionnaire, participants demonstrated improved knowledge and attitudes toward patient safety event reporting.	One of the limitations encountered in the study was the inability to track anonymous reports that may have been filed by residents or teaching faculty as anonymous reporters could not receive feedback after a full analysis of an incidence by the Department of Patient Safety and Accreditation.	High
Observational descriptive cross-sectional studies						
Wagner, Harkness, Hébert, and Gallagher (2012)	Describe factors influencing nursing error disclosure in Nursing homes (NHs) and perceptions of disclosing adverse events to residents and their families in NH settings.	"Communicating about Nursing Errors" (CANE)	A cross-sectional, descriptive study regarding CANE. A mailed survey of 1180 registered nurses (RNs) and registered practical nurses (RPNs) in Ontario, Canada to elicit responses regarding CANE.	Nurse respondents found disclosure to be a difficult process. RN respondents and nurses who had prior experience disclosing a serious error were more likely to disclose a serious error. Of the nurse respondents, 70.7% (n=834) indicated that their NH has an error reporting system for nurses to use. Among these respondents, 42.9% (n=506) have reported a near miss, 45.7% (n=539) have reported a minor error, 21.3% (n=141) have reported a serious error, and 11.9% (n=141) have never reported an error. With	A test-retest reliability was not conducted among nurses that participated in the pilot phase. A nonresponse bias also may have affected the results since many surveys were sent to those no longer working in NHs (nursing homes). Furthermore, other staff members who work in the NH setting that could be active participants in the disclosure process such as physicians, administrators, and social workers were not surveyed.	Good

Authors	Study aims/objectives	Outcome measures	Method and sample size	Findings	Study limitations	Evidence level
				regard to whether the respondents had ever discussed a nursing error with their colleagues, 70.6% (n=833) reported having discussed a near miss, 69.3% (n=818) a minor error, and 38.6% (n=455) a serious error; 11.0% (n=130) had never discussed a nursing error with a colleague. **Disclosure perceptions** Nearly half of the respondents (48.4%, n= 571) agreed that nursing errors are one of the most serious problems in NHs. To improve resident safety, 94.7% (n = 1118) of the respondents agreed that it was necessary to know about errors occurring in their NHs, but only 49.2% (n = 580) believed the current mechanisms to inform nurses about errors were adequate.		
Chiang (2010)	Examined factors that were determined to lead to failures in reporting medication administration errors (MAEs) for 838 frontline nurses from 5 teaching hospitals in Taiwan.	Improved nurse's experience of reporting MAEs and Improved attitude toward reporting self- and coworker-MAEs.	A cross-sectional study was conducted in 5 tertiary hospitals in southern Taiwan using self-administered survey questionnaires. Any nurse providing direct nursing care was eligible to be recruited	Results showed that 337 (47%) participating nurses had failed to report self- or coworker-MAEs and 376 nurses (52.4%) had not failed to report. The strongest predictors of the failure were experience of making MAEs, differences in attitude toward reporting self-and coworker-MAEs, and perceived MAE reporting rate in current work. The reporting barriers of fear, perception of nursing quality, and perception of nursing professional development significantly contributed to failure to report.	The convenience sampling method was used to recruit nurses and exclusion of newly hired nurses (i.e. < 3 months of experience) which may limit the generalizability of the study findings	Good

Authors	Study aims/objectives	Outcome measures	Method and sample size	Findings	Study limitations	Evidence level
Evans et al. (2006)	Assess awareness and use of the current incident reporting system and to identify factors inhibiting reporting of incidents in hospitals.	Knowledge and use of the current reporting system; barriers to incident reporting.	A cross sectional survey design using an anonymous survey of 186 doctors and 587 nurses from diverse clinical settings in six South Australian hospitals	Most doctors and nurses (98.3%) were aware that their hospital had an incident reporting system. Nurses were more likely than doctors to know how to access a report (88.3% v 43.0%), to have ever completed a report (89.2% v 64.4%); and to know what to do with the completed report (81.9% v 49.7%). Staff were more likely to report incidents which are habitually reported, often witnessed, and usually associated with immediate outcomes such as patient falls and medication errors requiring corrective treatment. Near misses and incidents which occur over time were least likely to be reported.	The non-probability sampling technique employed was reported to be inadequate but rather a random sampling technique would have been more appropriate for the study. Non-responder bias cannot be excluded due to the inability to collect information on non-responders as a result of anonymous design of the survey.	High
Abdel-Latif (2016)	Assess the knowledge of healthcare professionals about medication errors in hospitals	Knowledge of medication errors, availability of reporting systems in hospitals, attitudes toward error reporting, causes of medication errors.	A cross-sectional survey design was used to elicit information from 323 healthcare professionals in eight hospitals in Madinah, Saudi Arabia by an 18-itemself-administered survey questionnaire.	The majority of the participants had good knowledge about medication errors concept and their dangers on patients. Only 68.7% of them were aware of reporting systems in hospitals. Healthcare professionals revealed that there was no clear mechanism available for reporting of errors in most hospitals.	The search strategy was not reported. The evaluation of the strength and limitations of the study was not reported.	Good

Authors	Study aims/objectives	Outcome measures	Method and sample size	Findings	Study limitations	Evidence level
Alsafi et al. (2011)	Investigate the views of physicians about medical error reporting in a tertiary care hospital in Saudi Arabia.	Measure attitudes, practice, and views on medical error reporting.	An observational cross-sectional study of 161 physicians at Al-Iman General Hospital using an anonymous survey questionnaire.	Most of the respondents held the view that reporting medical error was an ethical issue and served a valuable purpose but do conceal an error committed to ''avoid punishment.''. Also, the reason given by 41.1% of the participants for not reporting a colleague's error was that ''it is not their responsibility.'' However, the gravity of the outcome of a medical error by a colleague to the patient was thought to be an important incentive for reporting.	The majority of the respondents were expatriate non-Saudi physicians which made the majority of the respondents to say they cannot report a colleague's error. This may limit the generalizability of the findings to other areas	Good
Carandang, Resuello, Hocson, Respicio, and Reynoso (2015)	Determine and compare the knowledge, attitude and practices (KAPs) on medication error reporting among health practitioners from hospitals in Manila.	Measure KAPs on medication error reporting among health practitioners from hospitals in Manila.	A qualitative cross-sectional survey was utilized to gather information from 180 health practitioners, consisting of physicians, nurses and pharmacists using a self-administered questionnaire.	The results showed that 72% of health practitioners were not knowledgeable on medication error reporting, however knowledge level differ across profession. The physicians (35%) have higher level of knowledge than nurses (12%). Majority of the health practitioners (58%) were classified to have unfavorable attitude towards medication error reporting. Only the pharmacists have higher proportion of respondents (52%) with favorable attitude compared to physicians (40%) and nurses (35%). More than half of the respondents (52%) are practicing medication error reporting.	The study was limited by the small sample size selected across each professions.	Good

Authors	Study aims/objectives	Outcome measures	Method and sample size	Findings	Study limitations	Evidence level
Garbutt et al. (2007)	Characterize pediatricians' attitudes and experiences regarding communicating about errors with the hospital and patients' families.	Physician attitudes and experiences about error communicatio n.	Cross-sectional survey of 439 pediatric attending Physicians and 118 residents participated in the study using an anonymous 68-item survey conducted between July 2003 and March 2004.	Most respondents had been involved in an error (39%, serious; 72%, minor; 61%, near miss; 7%, none). Respondents endorsed reporting errors to the hospital (97%, serious; 90%, minor; 82%, near miss), but only 39% thought that current error reporting systems were adequate. Most pediatricians had used a formal error reporting mechanism, such as an incident report (65%), but many also used informal reporting mechanisms, such as telling a supervisor (47%) or senior physician (38%), and discussed errors with colleagues (72%).	Respondents were asked about errors in which they had been personally involved, their attitudes and practices of error reporting and disclosure may vary depending on their degree of involvement in the event.	Good
Cross-sectional studies						
Zaheer, Ginsburg, You-Ta, and Grace (2015)	Examine in detail how ease of reporting, unit norms of openness, and participative leadership influence frontline staff perceptions of patient safety climate within health care organizations.	Measure how the ease of reporting, unit norms of openness, and participative leadership might be important variables for improving patient safety.	A cross-sectional study design was used on frontline staff. Data were collected using a questionnaire composed of previously validated scales.	The results of the study show that ease of reporting, unit norms of openness, and participative leadership are positively related to staff perceptions of patient safety climate.	The response rate for the staff questionnaire was reported to be 17% and a selection bias was identified due to the study being based on volunteer participation of hospitals and frontline health care staff. Also, the study data were collected in 2007.	High
Hobgood, Weiner, and Tamayo-Sarver (2006)	Determine if the three types of emergency medicine providers physicians, nurses, and out-of-hospital providers (emergency medical technicians [EMTs]) differ in their	Measure the differences in error identification, disclosure, and reporting by provider type.	A convenience sample of 116 health providers comprising physicians, nurses, and emergency medical technicians (EMTs) providers in an academic emergency department evaluated ten case vignettes that represented two error types	Of the 116 providers who were eligible Physicians were more likely to classify an event as an error (78%) than nurses (71%; $p = 0.04$) or EMTs (68%; $p < 0.01$). Nurses were less likely to disclose an error to the patient (59%) than physicians (71%; $p = 0.04$). Physicians were the least	The study was reported to use a modest sample size and the enrollment targets were not met for all categories of respondents recruited. The study compared types of providers without considering level of training.	Good

Authors	Study aims/objectives	Outcome measures	Method and sample size	Findings	Study limitations	Evidence level
	identification, disclosure, and reporting of medical error.		(medication and cognitive) and three severity levels.	likely to report the error (54%) compared with nurses (68%; p = 0.02) or EMTs (78%; p < 0.01). For all provider and error types, identification, disclosure, and reporting increased with increasing severity.		
Hajibabaee et al. (2014)	Evaluate nurses' reporting of medication errors.	Outcome measure included an evaluation of medication errors reported by nurses.	A descriptive survey of nurses working in medical, surgical, orthopaedic, gynaecology and obstetric wards in hospitals affiliated to Iran University of Medical Sciences conducted between November 2008 and May 2009. Stratified multistage sampling was employed and data were collected using a researcher-designed questionnaire.	The response rate was 93% (n = 286). More errors were made than were reported and this requires further investigation. The mean number of medication errors 'reported' per nurse during 3 months was 1.33 compared to the mean number of errors made which was 19.5. None of the individual and organizational characteristics reported were significantly related to reporting of medication errors. Failure to record vital signs (e.g. pulse, blood pressure etc.) before and after administering certain medicines was the most frequently reported medication error.	The number of participants was too low to explore small differences hence the study may have overlooked small but clinically important differences between groups in commission and reporting of errors. The lack of a comprehensive standard questionnaire of the Iranian clinical context was reported as a limitation in the study	Good
Smith et al. (2014)	Understand reporting practices and attitudes of professional in four large radiation oncology centers.	Evaluation of barriers to reporting, perceptions of errors, and reporting practices. The responses of physicians were compared with those of other	A survey was sent to staff members of four large academic radiation oncology centers, all of which have in-house reporting systems.	There were 274 respondents to the survey, with a response rate of 81.3%. Physicians and other staff agreed that errors and near-misses were happening in their clinics (93.8% v 88.7%, respectively) and that they have a responsibility to report (97% overall). Physicians were significantly less likely to report minor near-misses (P = 0.001) and minor errors (P= 0.024) than other groups. Physicians were significantly more concerned about getting colleagues	The study utilized large academic centers with existing incident reporting systems and a history of work done in the realm of patient safety and error reporting, whereas those from centers new to the culture of reporting may have a different set of challenges. Another limitation of the study is its dependence on self-	High

Authors	Study aims/objectives	Outcome measures	Method and sample size	Findings	Study limitations	Evidence level
		professional groups.		in trouble (P=0. 015), liability (P= 0.009), effect on departmental reputation (P= 0.006), and embarrassment (P< 0.001) than their colleagues. Regression analysis identified embarrassment among physicians as a critical barrier. If not embarrassed, participants were 2.5 and 4.5 times more likely to report minor errors and major near-miss events, respectively.	reported behaviors rather than actual behaviors.	
Yung, Yu, Chu, Hou, and Tang (2016b)	Explored the attitudes and perceived barriers to reporting medication administration errors and understand the characteristics of and nurses' feelings about error reports.	Explore if understanding of nurses' attitudes and perceived barriers to error reporting would increase error reporting rates.	A cross-sectional, descriptive survey with a self-administered questionnaire was completed by a total of 306 nurses of a medical centre hospital in Taiwan.	Nurses' attitudes towards medication administration error reporting were inclined towards positive. The major perceived barrier was fear of the consequences after reporting. The results demonstrated that 88.9% of medication administration errors were reported orally, whereas 19.0% were reported through the hospital internet system. Self- recrimination was the common feeling of nurses after the commission of medication administration error.	The study was conducted in one teaching hospital, hence some findings may not be generalizable to other institutions.	High
Hung et al. (2016)	Explore the effects of nurses' attitudes and intentions regarding medication administration error reporting on actual reporting behaviours.	Explore the effects of nurses' attitudes and intentions regarding medication administration error reporting on actual reporting behaviours.	This study used a cross-sectional design with self-administered questionnaires, and the theory of planned behaviour was used as the study's framework. A total of 596 staff nurses working in a regional teaching hospital of 1379 patient beds, located in the northern part of southern Taiwan was used for this study, conducted from September–November 2013.	Of the 596 nurses invited to participate, 548 (92%) completed and returned a valid questionnaire. The findings indicated that nurse managers' and co-workers' attitudes are predictors for nurses' attitudes towards medication administration error reporting. Nurses' attitudes also influenced their intention to report medication administration errors; however, no connection was found between intention and actual reporting behaviour.	Methodological limitations were identified in the study. First, sample-related issues was reportedly a limitation to the study's generalizability. Secondly, the design required participants to recall their experiences of reporting MAEs over the previous 3 months, which may have resulted in missing data.	Good

Authors	Study aims/objectives	Outcome measures	Method and sample size	Findings	Study limitations	Evidence level
Garbutt et al. (2008)	Elicit the attitudes of physicians regarding patient safety: to (1) determine physicians' willingness to share information about errors with their hospital and colleagues, (2) describe how physicians communicate about errors.	Determine if communication of information about errors and error prevention between physicians and their hospital could be improved patient safety.	A Surveys of 1,082 physicians at Washington University/BJC HealthCare, a system of thirteen academic and community hospitals in Missouri; two academic hospitals and multiple community-based settings affiliated with the University using a 68-item questionnaire	This survey found that most were willing to share their knowledge about harmful errors and near misses with their institutions and wanted to hear about innovations to prevent common errors. However, physicians found current systems to report and disseminate this information inadequate and relied on informal discussions with colleagues. Thus, much important information remains invisible to institutions and the health care system. Efforts to promote error reporting might not reach their potential unless physicians become more effectively engaged in reporting errors at their institutions.	The study included U.S. physicians from only two states, which potentially limits generalizability. In addition respondents were not asked to limit their responses to communication of their own errors, and attitudes and behavior might vary depending on the respondent's level of involvement with an error.	Good
Bahadori et al. (2013)	The survey aimed to study the factors influencing not reporting on medication errors from the nurses' viewpoints in Abbasi Hospital of Miandoab,	Designed a system for reporting on medication errors properly and accurately, training nurses in the quality of reporting on medication errors, and above all, establishing a mechanism to improve quality and patient safety	This was a cross-sectional, descriptive analytical study conducted on 100 nurses in 2012. The study was conducted in different inpatient units of Abbasi Hospital in Miandoab, an Iranian hospital affiliated to Urmia University of Medical Sciences using a consensus method. Required data were collected using a questionnaire consisting of two sections.	The study results showed that managerial factors (3.56 ± 0.996) had the greatest role in the refusal of reporting on medication errors. Other important reasons for not reporting are: factors related to the process of reporting (3.32 ± 0.797), and fear of the consequences of reporting (3.01 ± 1.039), respectively. Also, there was a significant relationship between employment status and fear of the consequences of reporting on medication errors (< 0.008).	Generalizability of the results was reported as a limitation due to the use of only one hospital and a small sample.	Good

Authors	Study aims/objectives	Outcome measures	Method and sample size	Findings	Study limitations	Evidence level
A descriptive quantitative Studies						
Alboliteeh and Almughim (2017)	Determine knowledge, attitude and practice of physicians and nurses toward the use of Occurrence Variance Reporting system (OVR) in order to improve patient safety.	Improved KAP of nurses and physicians toward the use of OVR system in Saudi Arabia	A descriptive quantitative design was conducted on 107 primary Healthcare (PHC) physicians and nurses, working at two PHC centers in Saudi Arabia by cluster and random sampling	In this study, the majority of physicians and nurses (89.5%) had good knowledge of OVR application. However, knowledge level was higher in the nurses, compared to the physicians (94% versus 53.6%), and they had a better practice level of the OVR system (82.1% versus 52.4%). In other words, physicians were more likely to have negative attitude toward the OVR system, compared to nurses (71.4% versus 42.9%). A significant difference was observed between the KAP of physicians and nurses toward the OVR system and other variables, including nationality, language and working site.	These results might have been affected by diverse nationality, language, and work site of the participants.	Good
Wagner, Castle, and Handler (2013)	Determined barriers and health information technology (HIT)-related facilitators to adverse event reporting among U.S. NHs.	Revealed respondents report of their adverse event reporting processes focusing on barriers and role of HIT facilitators.	A descriptive survey of 399 nursing home administrators in the United states using the Donabedian Quality of Care Conceptual Framework	About 15% (60/399) of NHs had computerized entry by the nurse on the unit and almost 18% (71/399) used no computer technology to track, monitor, or maintain adverse event data. NHs without HIT were more likely to not be accredited ($p = 0.04$) and not part of a chain/corporation ($p = 0.03$). Two of the top three barriers focused on fears of reporting as a barrier.	Greater response rate was reported in the better NHs compared to other less developed NHs. The geographical differences is a limitation to the generalizability of the result. The response rate of 44.3% was reportedly low.	Good
Härkänen, Saano, and Vehviläinen -Julkunen (2017)	Describe ways of preventing medication administration errors based on reporters' views expressed in medication administration incident reports.	Analyzed reporters' views regarding ways of preventing medication	A descriptive content study related to medication administration related incidents collected from two hospitals in eastern Finland between 1January 2013 and 31 December 2014.	Thus far, incident reporters' perceptions of how to prevent medication administration errors have rarely been analysed. Reporters' views regarding ways of preventing medication administration errors should be actively analysed and implemented. Reporters' views on	Descriptions of some incidents reports were reportedly quite short, which was responsible for the increasing risk of misinterpretation.	Good

Authors	Study aims/objectives	Outcome measures	Method and sample size	Findings	Study limitations	Evidence level
		administration errors.		preventing medication administration errors were divided into three main categories related to individuals (health professionals), teams and organisations. The following categories related to individuals in preventing medication administration errors were identified: (1) accuracy and preciseness (2) verification; and (3) following the guidelines, responsibility and attitude towards work. The team categories were as follows: (1) distribution of work; (2) flow of information and cooperation; and (3) documenting and marking the drug information. The categories related to organisation were as follows: (1) work environment; (2) resources; (3) training; (4) guidelines; and (5) development of the work.		
Ogundiran and Adebamowo (2012)	Examine the practice of information disclosure to patients by surgeons in Nigeria.	Revealed communica-tion inadequacies between surgeons and patients.	A descriptive design using a 55-item semi-structured open-ended questionnaire sent to 150 surgeons in south-western Nigeria in 2004–2005.	Findings revealed that a documented policy statement about information disclosure was not available in most hospitals. Only 22 (21.6%) of 150 surgeons routinely disclose operative findings to patients or their families. Thirty (29.4%) of 150 surgeons had been involved in disclosing medical errors to their patients in the past while 63 (61.8%) respondents did not know if surgical errors with potentially negative consequences should be disclosed.	The draw-backs of this study were that it was limited to mostly southwestern Nigeria and the nature of sample in terms of surgical trainees most of whom had been in surgical practice for only 5 years or less.	Good
Schiff et al. (2009)	Understand the types, causes, and prevention of missed or delayed diagnoses errors.	Solicit perceived cases of missed and	A survey of a convenience sample of physicians, including general internists, medical specialists, and emergency physicians conducted	A total of 669 error cases were reported by 310 clinicians from 22 institutions. After cases without diagnostic errors or lacking sufficient	A problem of selection bias was reported	Good

Authors	Study aims/objectives	Outcome measures	Method and sample size	Findings	Study limitations	Evidence level
		delayed diagnoses.	at two participating academic medical centers using questionnaires completed during medical grand rounds presentations on the topic of diagnosis errors.	details were excluded, 583 remained. Of these, 162 errors (28%) were rated as major, 241 (41%) as moderate, and 180 (31%) as minor or insignificant. Errors occurred most frequently in the testing phase (failure to order, report, and follow-up laboratory results) (44%), followed by clinician assessment errors (failure to consider and overweighing competing diagnosis) (32%), history taking (10%), physical examination (10%), and referral or consultation errors and delays (3%).		
Descriptive studies						
Nwozichi (2015)	Assess the perceptions of oncology nurses about why chemotherapy administration errors are not reported.	Identify perceived factors crucial to identifying strategic interventions that would promote reporting of all errors, especially those related to chemotherapy administration	This is a descriptive study that surveyed a convenient sample of 128 oncology nurses currently practicing in the Ogun State University Teaching Hospital, Nigeria. The tool for data collection was a structured questionnaire that consisted of two sections.	Findings showed that majority of the nurses (89.8%) have made at least one MAE in the course of their professional practice. Fear (mean = 3.63) and managerial response (mean = 2.87) were the two major barriers to MAE reporting perceived among oncology nurses.	This study was limited by the small sample size selected, which is a small group of all nurses working in oncology settings in Nigeria.	Good

Authors	Study aims/objectives	Outcome measures	Method and sample size	Findings	Study limitations	Evidence level
Heard, Sanderson, and Thomas (2012)	Explored the attitudinal/emotional factors influencing reporting of an unspecified adverse event caused by error. Determine whether there are different perceived barriers to reporting a case of anaphylaxis caused by an error compared with anaphylaxis not caused by error.	Examined barriers and strategies that anesthesiologists believe would facilitate reporting.	An anonymous, self-administered, mailed survey was conducted on 629 consultant anesthesiologists and 263 anesthesiology residents on the mailing list of the Australian and New Zealand College of Anaesthetists in Victoria, Australia. Participants were randomized into "Error" versus "No Error" groups for the specified anaphylaxis adverse event section of the survey. Data were analyzed using nonparametric descriptive and inferential tests.	Firstly, the result showed that Doctors who make errors are blamed by their colleagues. Secondly, when an error rather than no error had caused anaphylaxis, participants were more likely to agree/strongly agree that 6 statements about litigation, getting into trouble, disciplinary action, being blamed, unsupportive colleagues, and not wanting the case discussed in meetings, were perceived as reporting barriers. Finally, the most favored assistive strategies for reporting were generalized deidentified feedback about adverse event and error reports, role models such as senior colleagues who openly encourage reporting, and legislated protection of reports from legal discoverability.	Generalizability of the study may be difficult due to the fact that researchers only sampled anesthesiologists and anesthesiology residents in Victoria, Australia, and thus the results may not be transferable to anesthesiologists in other Countries.	Good
Kim et al. (2007)	Describe nurses' perception of frequency of error reporting and patient safety culture in their hospitals	Identify relationships between the nurses' perception and work-related factors.	An exploratory descriptive correlational study was conducted with 886 nurses at eight Korean teaching hospitals.	It was observed that errors were not reported as often as they should have been. Only two thirds of nurses (67%) said that they "always" reported mistakes that resulted in patient harm, stating that mistakes that could harm patients were "always" reported only about 1 out of 5 times. Only 17% of the nurses said that they "always" reported mistakes with no potential to harm or mistakes that were caught before affecting patients.	The study included only nurses from eight Korean teaching hospitals, which potentially limits generalizability.	Good

Authors	Study aims/objectives	Outcome measures	Method and sample size	Findings	Study limitations	Evidence level
Mixed method studies						
Kaldjian et al. (2008)	Investigated reporting of actual errors, likelihood of reporting hypothetical errors, attitudes toward reporting errors, and demographic factors.	Investigate reporting of actual errors, likelihood of reporting hypothetical errors, attitudes toward reporting errors.	Mixed method survey of 338 faculty and resident physicians in the mid-west, mid-Atlantic, and northeast regions of the United States was carried out to investigate reporting of actual errors, likelihood of reporting hypothetical errors, attitudes toward reporting errors, and demographic factors.	Most respondents agreed that reporting errors improves the quality of care for future patients (84.3%) and would likely report a hypothetical error resulting in minor (73%) or major (92%) harm to a patient. However, only 17.8% of respondents had reported an actual minor error (resulting in prolonged treatment or discomfort), and only 3.8% had reported an actual major error (resulting in disability or death). Moreover, 16.9% acknowledged not reporting an actual minor error, and 3.8% acknowledged not reporting an actual major error. Only 54.8% of respondents knew how to report errors, and only 39.5% knew what kind of errors to report.	Study data were collected in 2004 and 2005 and may not reflect more current attitudes or practices in the setting. Since the study only sampled, respondents in internal medicine, family medicine, and pediatrics, the result may not be generalizable to physicians in other specialties and in other practice settings.	Good
Schultz, Crock, Hansen, Deakin, and Gosbell (2014)	Evaluate the use of an online emergency department (ED) specific incident reporting system in Australasian hospitals.	The role of incident reporting in improving safety and quality in Australasian emergency medicine (EM).	A pilot study was conducted in three hospital's EDs using a semi-structured interviews of three site champions responsible for implementing Emergency Medicine Events Register (EMER and findings was transcribed by thematic analysis.	Findings revealed that over 354 days, the website received 362 unique visitors and 77 incidents. The median time to report was 4.6 min. The reporting rate was 0.07 reports per doctor month, suggesting a reporting rate of 0.08% of ED presentations. Data quality, as measured by the number of completed non-mandatory fields and ability to classify incidents, was very high.	Results might not be generalizable to other hospitals due to purposive recruiting. Also, a lower reporting rate from one pilot site hospital was reported.	Good
Uribe, Schweikhart, Pathak, Dow, and Marsh (2002)	Explore the factors that affect medical-error reporting among physicians and nurses at a large academic medical center located	Factors that serve as barriers to medical error reporting were explored	A nominal group session was conducted with nine professionals from medical center to identify the most relevant factors that act as barriers to error reporting and the 17 factors identified were	The matrix identified the factor for which immediate actions should be undertaken to improve medical error reporting (immediate action factors) It also identified factors that require long-term strategies (long-term	Inability to consider potentially significant variables in analyzing study results. Potentially explanatory demographic variables, such as years of	High

Authors	Study aims/objectives	Outcome measures	Method and sample size	Findings	Study limitations	Evidence level
	in the Midwest United States.	in an academic medical center as part of the efforts towards patient-safety enhancement.	subsequently used to form a survey questionnaire administered on 56 physicians and 66 nurses. Using these two parameters, the results were analyzed and combined into a factor relevant matrix.	strategy factors) as well as factors that the organization should be aware of but are of lower priority (awareness factors)	experience are not accounted for.	
Lederman, Dreyfus, Matchan, Knott, and Milton (2013)	Examine error reporting by nurses in hospitals using electronic media.	Determine whether the electronic media creates additional barriers to error reporting and what practical steps can all hospitals take to reduce these barriers.	This is a mixed-method case study of nurses' use of an error reporting system "RiskMan" in two hospitals. The case study involved one large private hospital and one large public hospital in Victoria, Australia, both of which use the RiskMan medical error reporting system.	The results showed a mismatch between rates of error reporting and the occurrence of errors and uncovered the reasons why this was so to include the following: lack of training, a hospital culture that limited nurse spare time, problems of computer access, and fear of retribution were all reinforced. The interviews showed that technology either exacerbated or failed to minimize problems that also existed with manual systems	Results might not be generalizable to other hospitals due to the use of a single site hospital in both private and public settings.	Good
Handler et al. (2007b)	Identify organizational-level and individual-level modifiable barriers to medication error reporting among healthcare professionals in nursing homes	Identify modifiable barriers to medication error reporting in the nursing home setting	Nominal group technique sessions was conducted on 28 professionals to identify potential barriers, followed by development and administration of a 20-item cross sectional mailed survey administered to 104 (67.5%) professionals. Participants include representatives of 4 professions (physicians, pharmacists, advanced practitioners, and nurses) from 4 independently owned, nonprofit nursing homes affiliated with the University of Pittsburgh. Barriers identified in the nominal group	The findings showed that respondents had worked for a mean of 9.8 years in nursing homes and 5.4 years in their current facility. Of 20 survey items, 14 (70%) had scores that categorized them as immediate action factors, 9 (64%) of which were organizational barriers. Of these factors, the 3 considered most modifiable were: (1) lack of a readily available medication error reporting system or forms, (2) lack of information on how to report a medication error, and (3) lack of feedback to the reporter or rest of	The study used a convenience sample for each of the profession-specific nominal group technique sessions. Using a random sampling technique may have strengthened the study by reducing selection bias. Second, a small number of nursing homes with similar characteristics such as bed size, region, and nonprofit status was used. Additionally, nursing home administrators were not included in the study because they are not part of the medication use process, nor do	High

Authors	Study aims/objectives	Outcome measures	Method and sample size	Findings	Study limitations	Evidence level
			technique sessions were used to design a 20-item survey	the facility on medication errors that have been reported.	they routinely report medication errors. These factors may limit the generalizability of result.	

Author	Study aims/objectives	Method and sample size	Findings	Study limitations	Evidence level
Qualitative studies					
Soydemir, Seren Intepeler, and Mert (2016)	Determine the barriers preventing physician and nurses from reporting medical errors. Identify barriers and motivators for error reporting by family physicians and their office staff based on the experiences of those participating in a testing process error reporting study.	A descriptive qualitative design was conducted with physicians and nurses working at a training and research hospital selected by purposive sampling. In-depth interviews were held total of 23 participants comprising eight physicians and 15 nurses between September 2014 and April 2015.	The result revealed that physicians and nurses do not choose to report medical errors that they experience or witness. When barriers to error reporting were examined, it was seen that there were four main themes involved: fear, the attitude of administration, barriers related to the system, and the employees' perceptions of error	The use of a single site training and research hospital could limit the generalizability of the study findings.	Good
Elder, Graham, Brandt, and Hickner (2007)	Identify barriers and motivators for error reporting by family physicians and their office staff based on the experiences of those participating in a testing process error reporting study.	A qualitative focus group study, conducted in 8 selected volunteer family Physician offices: 4 private practices and 4 family medicine residency clinics Participants include: 139 physicians, nurse practitioners, physician assistants, nurses, and staff who took part in 18 focus groups. The study made use of an interview guide as instrument for data collection.	Four factors were seen as central to making error reports: the burden of effort to report, clarity regarding the information requested in an error report, the perceived benefit to the reporter, and properties of the error (e.g., severity, responsibility). The most commonly mentioned barriers were related to the high burden of effort to report and lack of clarity regarding the requested information. The most commonly mentioned motivator was perceived benefit of reporting.	Firstly, the focus groups utilized in the study allowed a wide range of responses, but the most important ones cannot quantified. Secondly, the non-homogenous nature of some groups (physicians, staff, and nurses in one group) may have stifled some conversation. Finally, patient input was not included in the study, either as error reporters or focus group participants.	Good
Author	**Study aims/objectives**	**Method and sample size**	**Findings**		
Hartnell et al. (2012)	Enhance the understanding of barriers to medication error	A qualitative study was conducted using focus groups (with physicians, pharmacists and nurses) and in-	Incentives for medication error reporting were thematised into three categories: patient protection, provider protection and	The subjectivity about medication error reporting held by the healthcare	High

	reporting in healthcare organizations.	depth interviews (with risk managers) were used to identify medication error reporting beliefs and practices at four community hospitals in Nova Scotia, Canada. Audio tapes were transcribed verbatim and analysed for thematic content using the template style of analysis. The development and analysis of this study were guided by theSafety Culture Theory.	professional compliance. Barriers to medication error reporting were thematised into five categories: reporter burden, professional identity, information gap, organisational factors and fear. Facilitators to encourage medication error reporting were classified into three categories: reducing reporter burden, closing the communication gap and educating for success. Participants indicated they would report medication errors more frequently if reporting were made easier, if they were adequately educated about reporting, and if they received timely feedback.	professionals who participated in the focus groups was reportedly a limitation. Also, the small number of hospitals studied (four from one province) and the small number of interviews and focus groups also limits the generalizability of this research.	
Mixed method studies					
Covell and Ritchie (2009)	Obtain a comprehensive understanding of how nurses respond to medication errors and identify strategies that nurses believe may improve reporting within hospitals.	A concurrent mixed-method design was used to elicit responses from a convenience sample of 50 RNs employed as staff nurses in a variety of clinical settings in 1000-bed university health center located in a large metropolitan city in eastern Canada. The nurses were recruited primarily by snowball method between June and October 2007.	The participants' responses to the questionnaires and interviews indicated that they were aware that medication errors were underreported and factors within the work environment contributed to their decision to report the error or not. The merged findings also signify that the participants believed that fear had the greatest influence on nurses' reporting behaviors. They reported that responses from colleague and administrator affected how they felt about revealing errors and that completing an incident report was not too time consuming.	The reliability measures for the barriers to reporting subscales for this study were well below previously reported values. This could be attributed to the homogeneity of the sample which may limit the study's generalizability	High

Studies summarized in Table 2-2 include two systematic reviews, one integrative literature review, six descriptive studies, fifteen cross-sectional studies, three qualitative/focus group surveys, one post-interventional study, and six mixed methods studies.

The main themes that emerged from the published literature using the selected keywords:

- Awareness and use of incident reporting system in healthcare
- Frequency of reporting various types of error occurring in health
- Factors that serve as barriers to error reporting
- Factors that facilitate an error reporting culture in healthcare
- Patient safety

2.3.1 Awareness and use of incident reporting system

Evans et al. (2006) utilized an anonymous survey and validated instrument to assess awareness and use of the current incident reporting system and identified factors inhibiting reporting of incidents in six South Australian hospitals between November 2001 and June 2003 but failed to employ an appropriate sampling technique (random sampling). Garbutt et al. (2007) used a non-validated instrument to describe USA's physician attitudes and experiences of error communication, but failed to report on the attitudes or how often paediatricians report or disclose errors. Wagner et al. (2012) used a random sampling method to describe factors influencing nursing error disclosure in nursing homes (NHs) and perceptions of disclosing adverse events to residents and their families but was unable to sample other staff such as physicians. Wagner et al. (2012, p. 64) employed the Communicating about Nursing Errors (CANE) survey and defined: adverse events (that are expected to be reported in healthcare) as injury caused by medical management, nursing errors (when a nurse adversely affects or could have adversely affected a resident's safety and quality of care), serious error (causing permanent injury or life-threatening harm), minor error (causing harm that is neither permanent or life-threatening), and near miss (an error that could have caused harm but was intercepted). Therefore, awareness and use of error reporting are covered in Section 2.3.1 and will address the limitations identified in the studies of Evans et al., Garbutt et al. and and Wagner et al.

Reporting systems refer to methods designed with the goal of documenting healthcare errors for appropriate action to be instituted and implemented (Wolf & Hughes, 2008b). Error reporting appears to be a term mostly used in published articles from the USA, Canada, Saudi Arabia and the Philippines

(Abdel-Latif, 2016; Alsafi et al., 2011; Covell & Ritchie, 2009; Garbutt et al., 2007; Kaldjian et al., 2008; Wagner et al., 2012) whereas the term 'incident reporting' was found in published articles from the Finland and Australia (Evans et al., 2006; Härkänen et al., 2017; Schultz et al., 2014). In the present study, the term 'error reporting' will be used except when 'incident reporting' is in the title of a publication.

According to Covell and Ritchie (2009), the use of incident reporting systems in healthcare starts with workers recognizing errors or adverse events in care, outlining three stages: 1) the professional being aware that they have made an error; or 2) their colleague informs them that they had committed an error; or 3) the patient or family identifies an error that has occurred in his/her care process. However, communicating or disclosing errors are done in a number of ways in accordance with the hospital's or health institution's policies (Wolf & Hughes, 2008b). In advanced countries of the world like the USA, most errors in healthcare are reported via mandatory reporting systems (Wolf & Hughes, 2008b). Since the IOM report of 1999, many reporting systems have been developed in various countries at both local (institutional) and national levels (Kohn et al., 2000). Examples include the Occurrence Variance Reporting (OVR) System used in a Saudi Arabian study (Alboliteeh & Almughim, 2017) and the European Network for Patient Safety (EUNetPAS) launched in 2008 (Garrouste-Orgeas et al., 2012). Some hospitals have an established system of reporting (Alboliteeh & Almughim, 2017) while others lack such formal systems of reporting especially in developing countries (Ogundiran & Adebamowo, 2012). A documented policy statement about information disclosure was reported to be lacking in most Nigerian hospitals (Ogundiran & Adebamowo, 2012).

Conversely, many studies have shown that most health professionals were aware of error reporting systems (Abdel-Latif, 2016; Alboliteeh & Almughim, 2017; Evans et al., 2006; Wagner et al., 2012). Alboliteeh and Almughim (2017) reported that more than half of their study respondents (n=102/105, 97%) had a positive attitude towards the use of the OVR system while only (n=6/105, 6%) of the respondents had inadequate awareness thereof. However, physicians in this study were reported to have a negative attitude towards the OVR system compared to nurses (n=10/24, 42.9% physicians versus 60/84, 71.4% nurses). Also, Evans et al. (2006) in their study discovered that of the 186 doctors and 587 nurses recruited for the study, 98.3% (760/773) doctors and nurses were aware of their hospital's incident reporting system. Nurses had better knowledge of reporting system compared to doctors and were more likely than doctors to know how to access a report and know what to do with a completed report. Another study of nurses conducted in a nursing home revealed that 70.7% (834/1180) of respondents had good

knowledge of the hospital's error reporting system but 49.2% (n=580/1180) of respondents believed that the mechanisms to inform nurses about errors were adequate (Wagner et al., 2012).

However, despite the strengths of reporting systems in most institutions, many incidents are not reported probably for the same reasons they are omitted from medical records (Evans et al., 2006). Kaldjian et al. (2008, p. 44) attributed this under-reporting among physicians to poor knowledge of the reporting system stating that only 54.8% (185/338) of respondents knew how to report errors, and 39.5% (135/338) of respondents knew what kind of errors to report. Kaldjian et al. described knowledge about how to report errors as being essential, especially in a training environment where trainees need to observe a connection between institutional messages about the importance of reporting and clinical practice that makes such messages credible (Kaldjian et al., 2008, p 44).

Similarly, Abdel-Latif (2016) described a common and an important reason for poor reporting of medical errors in healthcare as lack of knowledge of what and how to report. Abdel-Latif (2016) observed that healthcare professionals accept that there are no clear mechanisms available for reporting of errors in most hospitals. However, Wolf and Hughes (2008b) reported that who should report an error is associated with professionals' understanding of what should be reported; this might have accounted for the reason why reporting systems are not utilized effectively in many hospitals (Alsafi et al., 2011; Kaldjian et al., 2008). Abdel-Latif (2016) reported further that their study respondents' poor knowledge of ERS was responsible for the staff not knowing where and when to report and which medical staff/hospital authority was responsible for reporting errors in the hospitals.

A number of studies have debated the use of ERS in hospitals and found that many reporting systems that are in existence are not used effectively (Alsafi et al., 2011). Findings from Alsafi et al. (2011) revealed that most of the respondents concealed errors and never embraced reporting to avoid punishment; while 41.1% (44/107) of the respondents reportedly concealed a colleague's error, believing that it was not their responsibility to report such errors. In addition, 33.7% (36/107) of the respondents reported that they would conceal a colleague's error to avoid loss of a good relationship with colleagues. However, this was not the case in a cross-sectional study of paediatric physicians' attitudes and experiences of error communication (Garbutt et al., 2007). The majority of physicians 92% (512/557) endorsed disclosing errors they were involved in and had formally reported 65% (362/557) of serious errors, minor errors, and near misses using the hospital's incident reporting system (Garbutt et al., 2007).

2.3.2 Frequency of reporting various types of errors occurring in health

Numerous cross-sectional studies conducted on medical errors in healthcare institutions have revealed that the most frequently occurring errors in patient care processes are those associated with medication or adverse drug reactions (Nwozichi, 2015; Yung et al., 2016b). A descriptive analytical cross-sectional study of nurses conducted in teaching and non-teaching hospitals in Iran detected that the most frequently reported errors were related to medications (Hajibabaee et al., 2014). However, Hobgood et al. (2006) reported that both medication and cognitive errors constitute major errors in health systems and that cognitive errors involve mistakes in diagnosis or treatment due to incomplete or inappropriate analysis of medical data. Examples includes making the wrong diagnosis or choosing the wrong test or treatment modality (Hobgood et al., 2006).

The UK National Health System (NHS) of the Greater Glasgow and Clyde Health and Safety Policy (2013, pg.15) highlighted clinical incidents and near miss types of errors that are reportable in healthcare such as: blood transfusion, breach of consent, inappropriate diet, discharge or transfer problem, lack of appropriate infection control, medication incidents, issues involving medical devices, patient observation and treatment problems. Schiff et al. (2009, p. 1882) on the other hand identified diagnostic errors as common and important errors made by physicians. According to Schiff et al. (2009, p. 1882), diagnostic errors refers to "any mistake or failure in the diagnostic process leading to a misdiagnosis, a missed diagnosis, or a delayed diagnosis".

The National Quality Forum (NQF) (2011) endorsed the listed 2002 serious reportable events, subsequently updated in 2011 to ensure appropriateness of each reportable event in healthcare. According to the National Quality Forum (NQF) (2011) serious reportable events in health care are: surgical or invasive procedure events, protection events such as breach of confidentiality, care management events or treatment errors that resulted in a patient receiving a wrong treatment or procedure, environmental events resulting in patient injury from falls. On the other hand, Wolf and Hughes (2008b) found that the most serious reports involved rule violations management practices and non-standardized practices (Wolf & Hughes, 2008b). Other forms of error included failure to communicate radiological, laboratory or pathological tests appropriately, hospital acquired infections, delay in treatment that could result in patients' death and pressure ulcers acquired after admission or presentation to the healthcare setting (NQF, 2011).

According to Ock et al. (2017), a considerable variation exists in the reported frequency of patient safety incidents among health professionals. The results of a Taiwan study conducted among nurses showed that 88.9% (272/306) of medication administration errors were reported but were verbal reports (Yung et al., 2016c). Therefore, the attitude of nurses towards medication administration error (MAE) reporting was reported to be good (Yung et al., 2016b). On the other hand, Hajibabaee et al. (2014) observed that the mean number of medication errors 'reported' by each nurse during a 3 month period was 1.33 compared to a 19.5 mean number of errors made. A study which examined the attitude and practice of faculty and resident physicians towards error reporting revealed that they had a strong belief that errors should be reported but only a small percentage of the group had reported errors committed (Kaldjian et al., 2008). Similarly, a study conducted in North Carolina Hobgood et al. (2006) showed that even though more physicians 78% (90/116) than nurses 71% (82/116) recruited for the study were able to classify an event as an error, physicians were the least likely to report the error 54% (63/116) compared to nurses 68% (79/116) (Hobgood et al., 2006).

A consistent finding in the literature is that nurses and physicians can identify error events, but nurses report more error events than doctors (Hobgood et al., 2006; Ock et al., 2017). Despite most staff knowing that an incident reporting system existed, almost 40% (71/186) of consultants and registrars had never completed a report (Evans et al., 2006, p. 41). In this study it was observed that nurses had good reporting practice and were more likely to report errors than doctors when both were faced with an error situation (Evans et al., 2006). Contrary to this, an exploratory study conducted by Kim et al. (2007) among Korean nurses showed that nurses were not positive about the openness of communication in their working environment as they reported only one in five mistakes committed. Although there is a paucity of empirical literature on physicians' error reporting practice, studies conducted by Garbutt et al. (2008); Kaldjian et al. (2008) indicated poor physician error reporting practice.

An investigation conducted into physician's attitudes and practices related to voluntary error and near-miss reporting in four large academic radiation oncology centers revealed that 97% (266/274) of physicians and other members of staff including nurses believed that errors and near-misses were happening in their clinics and that they had a responsibility to report these (Smith et al., 2014). Despite this, physicians were observed to be less likely to report events than other colleagues (Smith et al., 2014) and Garbutt et al. (2008) described the physicians in their study as "reluctant partners" in reporting medical errors; owing to their poor usage of the incident reporting system. This study shows that only a

small percentage of doctors formally reported incidents leading to a poorer reporting culture compared to other health personnel (Garbutt et al., 2008; Wolf & Hughes, 2008a).

Smith et al. (2014) classified medical error reporting based on the degree of seriousness or harm as: near misses, minor and major errors. A mixed methods survey of views on the reporting of a hypothetical error versus an actual error amongst 338 faculty and resident physicians in the USA showed that most respondents were inclined to report harm-causing hypothetical errors rather than actual errors and were likely to report errors based on error severity (Kaldjian et al., 2008). Evans et al. (2006) observed that incidents which are immediate, often witnessed, and habitually reported (such as patient falls and medication errors) were better reported than incidents which occurred gradually and were often not attributable to a single event. Similarly, a Canadian study conducted by Covell and Ritchie (2009) reported that the participants' decision to submit an informal or formal report was a factor if the error would cause immediate or serious harm. Covell and Ritchie (2009) reported that nurses only reported an error once they were convinced that the error would cause immediate or serious harm or jeopardize the well-being of the patient.

In conclusion, studies have shown that more errors are made than reported and this requires further investigation (Kaldjian et al., 2008). Considering the noteworthy differences that exist between the actual errors committed and those reported by healthcare professionals, it is imperative to monitor medical errors (Hajibabaee et al., 2014). Educational initiatives are needed to improve understanding of medical errors and efforts to encourage the use of an error reporting system (ERS) free of fear and punishment and should be intensified (Hajibabaee et al., 2014). Wolf and Hughes (2008b) suggested that information or data provided during medical error reporting processes should be available as a useful follow-up tool for identifying the potential or actual cause of errors. Such data are helpful in developing strategies for improved healthcare systems devoid of error occurrence and harzardous threats to patient safety (World Health Organization, 2014).

2.3.3 Factors that serve as barriers to error reporting

Under-reporting of errors in healthcare can be attributed to a number of factors that are perceived to be barriers to error disclosure (Smith et al., 2014). Although reporting medical errors in hospitals is intended to ensure patient safety, a report released by the Dallas, United State Department of Health and Human Services in 2012 following an investigation, found that most errors are not reported, but even when reported and investigated, the health institution seldom makes changes (Levinson, 2012). This

discourages workers from future reporting even in the event of similar and serious errors (Levinson, 2012). Error reporting is central to the discipline of nursing and medicine therefore it is imperative that various factors contributing to under-reporting should be identified and addressed to guarantee patient safety (Hartnell et al., 2012).

2.3.3.1 The fear factor

Yung et al. (2016b) indicate that fear which takes many forms constitute an important factor preventing health professionals from reporting errors. Examples of fear include: of being blamed by head nurses, supervisors and other colleagues; of being labelled as incompetent and inadequate; of judicial issues and job loss; of being distrusted by patients and families; and a fear of being exposed to the public by the media (Bahadori et al., 2013; Chiang, Lin, Hsu, & Ma, 2010).

Recently, studies conducted in various regions of the USA showed that the fear of adverse consequences of reporting medical errors for healthcare providers is broad and complex (Kaldjian et al., 2008; Smith et al., 2014). According to Holden and Karsh (2007), the consequences health professionals face after error reporting is the feeling of unpleasantness which is responsible for under-reporting culture among health professionals. Wolf and Hughes (2008b) described health professionals' experiences following serious errors as feelings of guilt, depression, being concerned for patient safety and fear of disciplinary actions (Heard et al., 2012). Consequentially, the inability of health institutions to protect their workers from negative consequences will continually cause dishonest attitudes towards error communication (Smith et al., 2014). In addition Hartnell et al. (2012) indicated that professionals' fear of negative reactions from patients is another perceived barrier factor to error reporting. Heard et al. (2012) reported that 46% (199/433) respondents recruited for their study strongly agreed that doctors who make errors are blamed by their colleagues. Hung et al. (2016) reported that the attitude and willingness of health professionals to MAE reporting are influenced by hospital nurse managers and co-workers**.**

Many researchers assert that fear of being punished also prevents health professionals from reporting errors (Alsafi et al., 2011; Heard et al., 2012). Alsafi et al. (2011) described punishment as a disciplinary action taken by hospital administrations like salary deductions and termination of contracts or appointments. In a similar way, Wolf and Hughes (2008b) described efforts of health professionals to self-report as being hindered by factors such as fear of threatened career such as job sanction. Smith et al. (2014) on the other hand described embarrassment as the biggest barrier to error reporting in healthcare most especially among physicians 52.3% (35/67) compared to non-physicians 27.6%

(57/207) inclusive of nurses. This has accounted for the reasons why many workers fail to admit mistakes when they occur or pretend as if such errors never happened (Wolf & Hughes, 2008b).

This is evident by the findings of Alsafi et al. (2011, p. 146) who reported that an equal number of their sampled physicians disagreed with the view that ‘‘punishment will be less if error is reported”. The study further indicates that 43% (46/107) of physicians agreed that they would conceal the occurrence of a medical error they incurred to avoid being punished (Alsafi et al., 2011, p. 146). In another study conducted in Saudi Arabia, 44.8% (50/107) of the respondents had a strong believe that reported errors would affect their annual evaluations (Alboliteeh & Almughim, 2017). A similar survey of nurses conducted in Korea found that 31% (275/886) of the study’s respondents were worried that their mistakes or errors were kept in files and would subsequently be used against them (Kim et al., 2007). As such, fear of reprimand and punishment by the administrator hinders reporting practice of doctors and nurses (Bayazidi et al., 2012; Smith et al., 2014).

Furthermore, many errors go unreported by health professionals owing to fear of litigation or legal suits (Heard et al., 2012). Yung et al. (2016b) reported that participants in their study were fearful that written reports of MAE would be used as evidence against them in the event of a law suit. Hartnell et al. (2012) described this fear of exposure to malpractice suits as negative reactions mostly from those families with previously threatened lawsuits that are very difficult to deal with. Perez et al. (2014, p. 48) indicated that what emerges from litigation is the fact that professionals are faced with recriminations from patients, lawyers, hospital-employers, insurance companies, and their own conscience, along with threats of incurring legal and financial penalties.

2.3.3.2 Lack of error reporting system or forms for reporting

Another factor perceived as a barrier to error reporting is the process and method involved in medical error reporting (Bahadori et al., 2013). Studies indicate that many health institutions lack a system for reporting errors and the few available hospitals that have an ERS fail to follow the standard guidelines for maintaining the system or tracking errors (Evans et al., 2006). A mixed methods survey of 154 health professionals in four nursing homes revealed that lack of a readily available reporting system or forms are important organizational barriers to error reporting (Handler et al., 2007b). In their study conducted in a large teaching hospital in Taiwan Yung et al. (2016b) confirmed that medical error reporting occurs in an informal, casual and unceremonious manner among healthcare professionals directly involved in patient care. Similarly another study (Uribe et al., 2002) confirmed that many errors leading to

complications are discussed verbally or on a one-on-one basis in clinical meetings. Yung et al. (2016b) reported that 88.9% (272/306) nurses who participated in their study were unofficially in the reports of errors made and were more comfortable to report to the head nurses 67.6% (207/306) than to report through the hospital's reporting system.

Furthermore, Covell and Ritchie (2009); Pfeiffer, Manser, and Wehner (2010) reported that the willingness of health professionals to disclose error is a factor of chance and access to the resources for reporting. This is because a person's intentions to report an incident are not only affected by their attitude toward the behavior, but also by the resources required to report an incident (knowledge and skill, accessibility to the reporting channel and self-determination ability) (Covell & Ritchie, 2009; Pfeiffer et al., 2010).

2.3.3.3 Poor error reporting systems design /lack of system effectiveness and appropriateness

Hartnell et al. (2012, p. 363) described lack of system effectiveness as an organizational barrier that relates to how thing were done within the organization after reporting. Brunsveld-Reinders et al. (2016) reported that of the 23 incident reporting system (IRSs) identified in their review, none completely fulfilled the WHO checklist criteria for patient safety. A survey of 1,082 US physicians conducted by Garbutt et al. (2008) found that most of the respondents were willing to share their knowledge about harmful errors and near misses and to report errors and hear about innovations that prevent common errors but found the hospital's error reporting system inadequate. This had also increased the reliance of many health providers on informal discussions with colleagues thereby not disclosing much important information to institutions and the health care system (Garbutt et al., 2008). In addition, a cross-sectional study conducted in Taiwan showed that only a small percentage of or no medical errors are reported formally as only 19% (58/306) of errors were reported formally through the hospital's internet system (Yung et al., 2016b).

Numerous studies have shown that certain institutional factors relating to error reporting that are encountered by professionals are perceived as barriers (Holden & Karsh, 2007; Smith et al., 2014). Similarly, Hartnell et al. (2012) observed that failure of health institutions to do anything about reported errors and the lack of trust about how reports might be used are perceived to hinder reporting practice among professionals. Contrary to the observation of Hartnell et al. (2012), Levinson (2012) reported that 28 of 40 (70%) reported events led to investigations, while five (12.5%) of these events led to policy changes, indicating that nurses often reported events identified through the regular course of care.

2.3.3.4 Lack of education/clarity regarding the information to report

Apart from the burden of reporting, the perceived benefit to the reporter and properties of the error (severity and responsibility), lack of clarity about the nature of the information requested in an error report is perceived as a barrier to reporting (Elder et al. (2007). Levinson (2014) attributed underreporting of incidents to staff misperceptions of what constitutes patient harm. Similarly, Soydemir et al. (2016) reported that doubt about what constitute an adverse event or error in care process is a factor hindering reporting practice of health professionals. Handler et al. (2007b); Lederman et al. (2013) reported that some institutions fail to provide education on what reporting entails and by what means reports should be made. Also, Evans et al. (2006) indicated that lack of awareness as to what information to report, who is actually supposed to make a report, what to report, where and when to report and how reports should be made constitute a reporting barrier.

Similarly, Bahadori et al. (2013) identified the lack of a clear definition of medication errors as an important variable influencing poor reporting of medication errors from the nurses' viewpoints who had been recruited for the study undertaken in Iran. A study conducted by Levinson (2012) also attributed under-reporting to inability by most health professionals to perceive that an error had occurred or that the error was significant enough to be reported. Kaldjian et al. (2008, p. 44) reported that "Knowledge about how to report errors is essential, especially in a training environment in which trainees need to observe a connection between institutional messages about the importance of reporting and clinical practices that make such messages credible."

2.3.3.5 Time factor associated with reporting

According to Hartnell et al. (2012); Lederman et al. (2013), the extra time and work involved in completing a report and the unfavourable characteristics of incident report forms is yet another barrier to reporting practice and a burden to professionals. Garbutt et al. (2008) reported that reporting failure was attributed to insufficient time needed to make a report.

Contrary to these findings, the participants in another study reported that filling out incident reports were not very time consuming which they did after notifying the physician of the error (Covell & Ritchie, 2009; Hung et al., 2016) reported that the time spent on reporting was negligible. This was attributed to the setting in which the study was conducted being a large teaching hospital which was likely to have a satisfied workforce and better working conditions (Hung et al., 2016).

Other factors associated with under-reporting include: doubt in the confidentiality of the error reporting system, lack of system usefulness and staff becoming accustomed to common occurrences and therefore not submitting reports (Holden & Karsh, 2007; Perez et al., 2014). Also, the belief that if errors are made by another colleague reporting the error would cause conflict with coworkers so this was found to be a reporting barrier (Covell & Ritchie, 2009; Hartnell et al., 2012). So too, characteristics of and interactions within the work environment such as management, training/education, work-force and work design factors (staffing ratios) and quality improvement practices influence error reporting and patient safety (Chiang et al., 2010; Holden & Karsh, 2007).

2.3.4 Factors that facilitate error reporting

Although reporting of medical errors is a widely recognized mechanism for initiating patient safety improvement, little is known about the feasibility of error reporting in physicians' offices, where the majority of medical care occurs in the United States (Elder et al., 2007). However, what is widely known is that under-reporting can compromise patient safety and thus the barriers to reporting should be successfully overcome (Hartnell et al., 2012) to improve patient outcomes (Perez et al., 2014). Perez et al. (2014) assert that when an error occurs the effect is not only seen on patients involved but also the person who has committed the error. Smith et al. (2014); Soydemir et al. (2016) suggested that alleviating all forms of fearful feelings experienced by providers following the occurrence of errors is essential to improve patient safety.

2.3.4.1 Education and training intervention

The adequacy of education and training regarding patient safety event reporting is another factor perceived to facilitate reporting practice of health professionals (Elder et al., 2007; Hartnell et al., 2012). Importantly, teaching professionals what and how to report as well as who to report an incident or error to will increase their knowledge of the reporting process (Evans et al., 2006; Garbutt et al., 2007). Every health institution is expected to provide this information to its employers upon appointment through staff orientation programmes. Without such efforts, the effect of federally protected patient safety reporting systems is likely to be reduced and the reporting bias inherent in these systems is unlikely to diminish (Kaldjian et al., 2008). Wolf and Hughes (2008b) suggested that education should be provided in workshops where the nature of errors, the design of safety systems and best practices in medication safety are discussed. This initiative will help hospitals to identify and address individual and organizational or system factors contributing to errors.

2.3.4.2 Electronic error reporting system/health information technology

Holden and Karsh (2009) described reporting systems as a form of paper-based or electronic system used by health care providers to report in some detail the occurrence of safety-related events. One way in which some health care organizations have attempted to reduce fear of reporting is through the use of health information technology (HIT) (Wagner et al., 2013). HIT is a form of computer-based reporting system (CBR) also referred to as an electronic error reporting system, a strategy that fosters a reporting culture in a hospital (Lederman et al., 2013). CBR allows input of data or error occurrence directly onto a computer for onward action to be implemented by appropriate the body (Wagner et al., 2013).

Lederman et al. (2013) reported the following beneficial outcomes of an electronic or computer-based reporting system: (a) promotion of empowerment to report; (b) easy tackling of emerging and systemic problems; and (c) efficient aggregation of high-quality data enables easy spotting of the patterns and trends in errors and incidents. HIT structures can help with improving reporting by minimizing staffs fear of reporting events (Holden & Karsh, 2009). For example, computerized incident reporting systems have the potential for staff to report anonymously"(Wagner et al., 2013). In certain situations, healthcare providers have the chance of calling from home without having to physically report errors thereby making reporting anonymous and improving patient safety.

2.3.4.3 Establishment of functioning reporting systems

A successful voluntary reporting system will only find success in a health care system that encourages honest disclosure and where errors are perceived as a system fault rather than individual carelessness (Smith (2014). Similarly, Handler et al. (2007b) suggested that efforts to improve error reporting frequency should focus on organizational-level rather than individual-level interventions. This practice not only ensures that reports are not used against workers but safety of patients is guaranteed (Holden & Karsh, 2007). However, Alsafi et al. (2011) assert that a reporting system designed or perceived to inflict punishment on reporting workers will discourage a reporting culture.

Therefore, overcoming the barriers to error reporting requires an effective reporting system which involves minimum time and effort and a process emphasizing that information gathered is directly used to improve the practice environment (Elder et al. (2007); Handler et al. (2007b); Hartnell et al. (2012). Wolf and Hughes (2008b) suggested that a reporting system with quality management processes is needed to influence the submission of error reports.

2.3.4.4 Addressing system failure

Hartnell et al. (2012) suggested that addressing system failure and poor satisfaction with hospitals' current reporting systems is perceived to facilitate a reporting culture of health professionals. Holden and Karsh (2009) conceptual model proposed that reporting systems should: fit the reporting environment (the characteristics of the work system or hospital), be useful to the employees and be easy to use, not requiring extra effort for its utilization (Heard et al., 2012). Hartnell et al. (2012) assert that effective strategies to promoting error reporting include reducing the burden of reporting by reducing the time it takes to report and frustration arising from cumbersome incident report forms. There should be an improvement in communication among all levels of staff through good interpersonal relationships from the senior management team to the health care professionals down to the students (Smith et al., 2014). Improving an error reporting system can be achieved through education or training related to the importance of analyzing errors and how information provided will be made confidential (Holden & Karsh, 2007; Wolf & Hughes, 2008b). Role models, supervisors, hospital employers who openly encourage reporting will improve the reporting practice among healthcare providers (Heard et al. (2012).

2.3.4.5 Feedback

Heard et al. (2012) reported that the most preferred perceived assistive factor for facilitating reporting was generalized deidentified feedback about adverse events and error reports. Physicians' willingness to report errors had to do with the confidence that reported information would be used to make improvements with the provision of appropriate outcomes, otherwise, formal reports were unlikely to be made in such health institutions (Garbutt et al., 2008).

Fundamentally, follow-up on reported errors improves the reporting behaviour of healthcare providers in that reporting is not viewed as a mere waste of time (Wolf & Hughes, 2008), a view supported by Holden and Karsh (2009) suggesting that professionals viewed reporting as not being worthwhile or useful when the system is not designed to provide follow-up on reported errors. One of the barriers to medication error reporting identified by participants in the study by Hartnell et al. (2012) was the feeling that nothing happened as a result of reporting. This attitude could slow down or result in poor error reporting practice as employees view the system as not bringing any positive outcomes (Holden & Karsh, 2009).

2.3.4.6 Protection from litigation

Elder et al. (2007) suggested that the practice of a blame culture should be eliminated at all levels of a health institution. Legislated protection of error information or data from use in litigation is a key element of improved reporting practice (Perez et al., 2014; Smith et al., 2014). The culture of malpractice suits ravaging the healthcare system should be adequately addressed (Wolf & Hughes, 2008b) . Kalra, Kalra, and Baniak (2013) assert that blaming and shaming culture will discourage participation in system improvements. Hartnell et al. (2012); Perez et al. (2014) affirmed that assuring staff who reporter errors of protection from discovery or legal consequences, offering options for anonymity and confidentiality and having external, independent agents process reports will improve reporting practice among care providers (Holden & Karsh, 2009).

Reportedly, incentives have improved the reporting behaviour of professionals in healthcare (Holden and Karsh (2009). Hartnell et al. (2012); Perez et al. (2014) motivate for incentives to encourage reporting practice of health professionals. These incentives are related to reward, praise and promotion (Handler et al., 2007b; Smith et al., 2014). However, where shame, guilt feelings, job sanctions, license withdrawal and litigation applies, reporting practice is discouraged (Smith et al., 2014). In addition, Heard et al. (2012) reported that incentives could be in the form of payments given to reporters of errors but the majority of the respondents in their study did not agree that incentives necessarily encourage reporting.

2.3.5 Patient safety and health outcomes

Wagner et al. (2012, p. 63) reported that while errors should be avoided as much as possible, the reality is that the health care delivery system is not and will never be perfect because errors and adverse events are an inevitable part of care. Studies conducted in nursing homes showed that the most knowledgeable healthcare professionals can commit or be associated with errors in patient care processes. This is because healthcare providers constantly associate with patients with complex health needs, which in turn increases the risk of errors (Wagner et al., 2012). The World Health Organization (2009) suggested that concentrating on a reporting culture and appropriate learning from errors is one of the most important areas for improvement in patient safety in hospitals today.

According to the National Quality Forum (NQF) (2011, p. i), error reporting initiative not only improves the safety of healthcare delivery but saves lives, helps avoid unnecessary complications, and increases

the confidence that receiving medical care actually makes patients better and not worse. Findings from a pre- and post-intervention study conducted by Louis et al. (2016) show that educational interventions for improved reporting played a key role in patient safety and improved error reporting, evident in the wide variability of errors reported per month following the training to improve knowledge and skills related to patient safety event reporting (Louis et al., 2016).

In a cross-sectional study of 14,725 nurses, physicians and pharmacists conducted in Ontario Canada, the ease of reporting, a norm of openness in the units and participative leadership were described as important factors in the improvement of patient safety (Zaheer et al., 2015). Despite the importance of error reporting as a facilitating factor in patient safety and improved health outcomes, adequate reports of medical errors in health systems are lacking (Hartnell et al., 2012). Since the IOM report of 1999 identified the occurrence of medical errors and under-reporting in most US hospitals, similar evidence from recent studies conducted on doctors and nurses have also suggested a high rate of under-reporting (Garbutt et al., 2008; Kaldjian et al., 2008; Smith et al., 2014; Yung et al., 2016c). Therefore, an effort should be made to improve reporting rates to promote not only patient safety but also improved outcomes (Garrouste-Orgeas et al., 2012).

Disclosing or reporting errors can serve various purposes but learning and system improvement are arguably the most essential purposes (Mahajan, 2010). Analyzing and processing reportable events help to develop and disseminate 'lessons learned' to guide safety-enhancing changes to the health care system (Holden & Karsh, 2009; Holden & Karsh 2007). Similarly, the value of reporting was also described as enhancing learning regarding causation of incidents and systemic changes needed to prevent error recurrence (Mahajan, 2010). It was also argued that interventions such as planning work procedures, documentation of care processes and errors, ordered procedures and the development of an efficient ERS decrease the incidence of medical errors and increase reporting rates (Joolaee, Hajibabaee, Peyrovi, Haghani, & Bahrani, 2011).

Therefore making the occurrence of medical errors less complex is a priority that should be embraced to enhance patient safety and improved outcomes (Hartnell et al., 2012; Smith et al., 2014). The World Alliance For Patient Safety Drafting Group et al. (2009, p. 154) proposed various actions needed to reduce risks and improve the quality of care in health systems. These risk reduction factors were classified into patient, staff and organisational/environmental factors:

- Patient risk reduction factors include: Provision of Adequate Care/Support, Provision of Patient Education/Training, Provision of Protocols/Decision Support, Provision of Monitoring Equipment, Provision of Medication Dispensing aid.
- Staff risk reduction factors comprise training, orientation, supervision/assistance, strategies to manage fatigue, availability of checklists/protocols/policies and adequate staff numbers/quality.
- Organizational/Environmental risk reduction factors involve matching physical environment to needs, making arrangements for access to a service, performing risk assessment/root cause analyses, current code/specifications/regulations being met, arranging ready access to protocols/policies/decision support, improved leadership/guidance, matching of staff to tasks/skills, improving safety culture agent/equipment factors, provision of equipment and regular audits.

In addition, an open policy in relation to reporting of medical errors is needed to enable organizations to gather vital information about the factors that contribute to medical errors (Hajibabaee et al., 2014; Perez et al., 2014). Policies provide a learning environment for health professionals and improved safety of patients in healthcare systems is sure to be guaranteed (World Health Organization, 2014).

2.3.6 Conceptual framework which guided the study

2.3.6.1 Introduction

Classical scientists have used theory to refer to an abstract generalization that offers a systematic explanation about how phenomena are interrelated (Polit and Beck (2012). Applying theory to the issues of error reporting in healthcare, Holden and Karsh's (2009) theoretical model of health information technology (HIT) usage behavior with implications for patient safety was used to guide and interpret the findings of the present study. This model made use of extant theory (motivation, decision making, and technology acceptance theories) that led to the formulation of 12 principles which were subsequently used to develop testable models of HIT. The case of medical error reporting technology was used to support the validity of the proposed HIT usage behaviour.

2.3.6.2 History and background to the theoretical model/the reason for the model development

A number of studies have enumerated the degree to which medical errors, injuries, deaths, and associated costs are a problem in their respective health care delivery systems and each served as a call for systems-

minded reform (Donaldson, 2002; Donaldson, Corrigan, & Kohn, 2000). One notion put forth in these error reporting studies which has since then been echoed repeatedly is that technology may hold the key to reducing medical errors and promoting patient safety. To this end, a theoretical approach was argued and demonstrated using the context of medical error reporting technology and a theoretical model that may be applied to error reporting systems (Holden & Karsh, 2009).

Holden and Karsh (2009) observed that the most obvious case of a HIT system whose efficacy suffers from underuse is the medical error reporting system. Up to 96% of medical errors are estimated to go undisclosed (Barach & Small, 2000). Thus, Holden and Karsh (2009) used reporting system behaviour as an illustration of the theoretical approach to the HIT model and presented a general HIT usage behaviour model (Figure 3.4) that incorporates 12 principles, and suggestions for using the model. The model is an extension of an empirically developed mixed level model of error reporting system originally developed by Karsh et al. (2006) and then refined in light of additional error reporting research by Holden and Karsh in 2007.

2.3.6.3 Theories used to generate the Holden and Karsh Health Information Technology (HIT) model for error reporting systems

Holden and Karsh (2009) utilized some of the more prominent existing theories of human behaviour and technology acceptance to present their model in three categories:

- theories of motivation address the requirement and belief of an individual (health professional) and explain what drives individuals to use, misuse or avoid using HIT, one of which is the ERS (Holden & Karsh, 2009, p. 24);
- theories of behavioural decision-making address both the unconscious and carefully thought processes that transpire when healthcare practitioners are deciding whether to use HIT (that is, ERS). The theories describe the link or interaction that exists between a person (reporter), the environment (social/cultural and physical environment) of the reporter and the actual reporting behaviour (Holden & Karsh, 2009, p. 26); and
- theories of technology acceptance provide a theoretical framework in which users (clinicians) interact with technology (ERS) and the end result of this interaction can determine future HIT (e.g. ERS) usage behaviour (Holden & Karsh, 2009, p. 29).

Holden and Karsh (2009, pp. 25-30) utilized the three theories stated above to generate the following 12 principles that serve as a basis for effective utilization of an effective ERS in healthcare:

P**rinciple 1:** proposes that HIT (ERS) use should meet, not jeopardize user needs; **Principle 2:** That HIT use should be easy (low-effort), not difficult; **Principle 3:** HIT use should lead to observable outcomes (Holden & Karsh, 2009, p. 26); **Principle 4:** HIT use outcomes should be positive/useful; **Principle 5:** User self-efficacy will influence HIT use decisions; **Principle 6:** Feedback following HIT usage behaviour will influence future usage; **Principle 7:** HIT usage behaviour is an interaction of multiple environmental and personal factors; **Principle 8:** HIT usage behaviour is based on users' beliefs, attitudes, norms, and perceptions; **Principle 9:** One's social and cultural environment affects the desirability of HIT use; **Principle 10:** The degree to which HIT use is voluntary, or controllable, will have an effect on HIT usage behaviour; **Principle 11:** Successful HIT design depends on the fit between characteristics of the HIT and characteristics of the work system; **Principle 12:** Successful HIT outcomes depend on the fit between elements within the work system where the HIT is implemented.

2.3.6.4 A theoretical model of health information technology usage behavior with implications for patient safety

Holden and Karsh's (2009) integrated model of HIT usage behaviour shows that no one theory can describe the complex nature of error/incident reporting. Therefore, several theories have been presented that can be used to understand HIT usage behaviour. They provided explanations of possible pathways through which various design factors affect important HIT outcomes like use and misuse. The case of medical error reporting behaviour was used as an illustration. By grounding HIT usage behaviour in theory, conceptual principles were generated, and the validity of these principles was demonstrated in that they reflected the error reporting literature. As a result, these principles can be combined in a model of HIT usage behaviour, like the one illustrated in **Figure 2.2.**

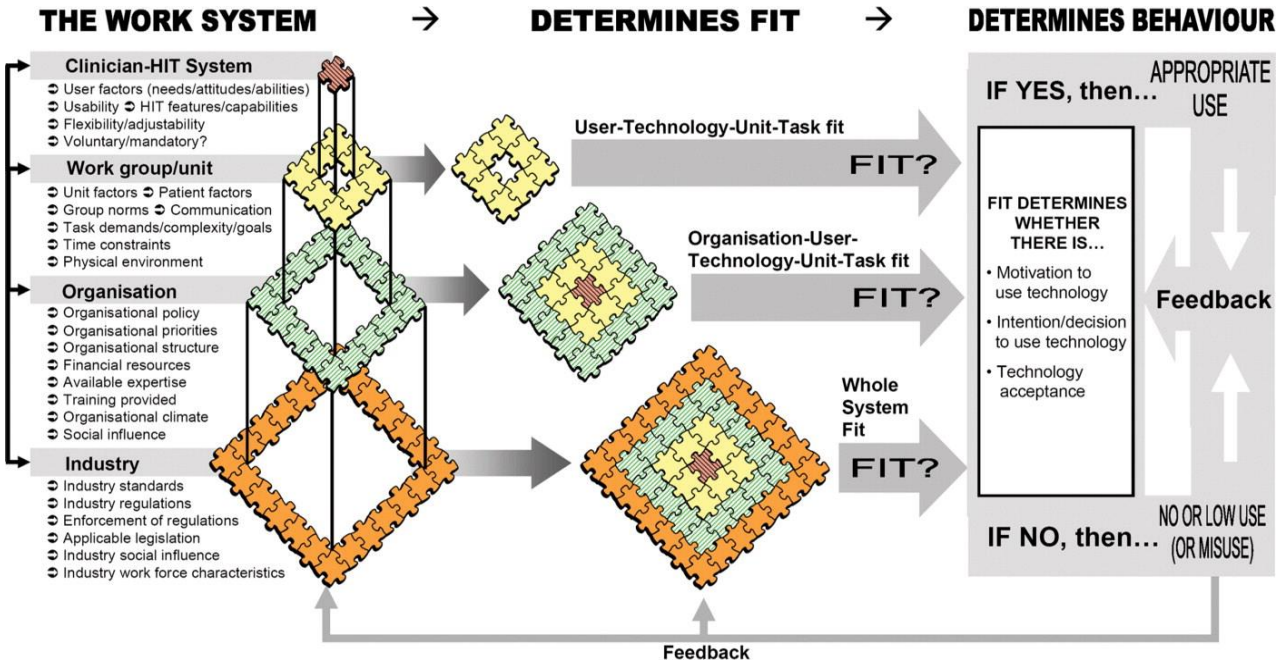

Figure 2-2: An integrated model of HIT usage behaviour Adopted with permission from Holden & Karsh (2009).

This new model, extended to generalize to the use of any HIT (ERS), states that the work system is comprised of numerous interfaces between and within various levels. The left side of the figure depicts a subset of these factors comprising a multilevel work system. The multilevel, multi-factor nature of these systemic antecedents to HIT usage behaviour follows Principle 7: The clinician – HIT system and its characteristics (for example, HIT ease of use/usability, capabilities, flexibility, and clinician skills, attitudes, needs) interact directly with the context where it is applied (for example the work group or unit), as well as indirectly with levels higher-up (for example, the overall health care organization). These between-levels interactions and the interactions between work system characteristics within levels determine fit, a central concept derived from Principles 11 and 12.

Fit may occur when the HIT matches user needs and beliefs (Principles 1 and 8), its usability matches the capabilities of the user (Principles 2 and 5), its outcomes match the desires of the users and other stakeholders and are observable (Principles 3 and 4), and the policies and social and cultural environment of the work system match the clinician usage requirements (Principles 9 and 10). Thus the design of the system determines the fit between the end users, the technology, the physical and social environment, organizational policies and rewards, and the tasks. Fit produces the corresponding outcomes discussed in the theories reviewed above. These include motivation, intention and decisions to use the HIT, and

technology acceptance. In turn, the outcomes influence HIT usage behaviour, and the consequences of this behaviour can modify the system and future behaviour through feedback (Principle 6).

2.3.6.5 Application of HIT usage behaviour model to error reporting practice

The model provides and encourages understanding of the interactions that produce fit, a truer depiction of the complexity of health care systems (Holden & Karsh, 2007) and describes the needed flexibility for design and effective utilization of a reporting system, allowing healthcare providers to embrace or discourage reporting behaviour. The model revealed that the design of an ERS could influence the reporting behaviour of clinicians. A system that is well designed to fit the need of clinicians, the technology, physical and social environment of a health system, policies and rewards, and the nature and type of task existing in health institutions will go a long way to influence reporting behaviour and use of an error reporting system either positively or negatively (Holden & Karsh, 2007).

It is imperative that in designing an ERS, consideration for a system that fits within the error reporting context of a hospital be put in place. Such a system must match the cultural context of the health institution, the plans intended to be achieved by designing such a system (goals), the staff's/user demand and importance of the system (need), customary ways in which the system will be operated (practices) and the attributes of the organization (organizational characteristics) (Holden & Karsh, 2007). This model was chosen because it provides a good understanding of the interaction that exists between the design of an error reporting system, reporting barriers and reporting practice. Therefore, the structure of a reporting system will determine barriers and motivators faced by health professionals who report errors while a good reporting system is needed to overcome the barriers that such reporters encounter in making reports (Holden & Karsh, 2009).

2.4 Summary

The narrative review of the literature in this chapter provides an overview of medical error occurrence in healthcare, various barriers contributing to poor reporting of these errors and factors that can improve reporting practices among healthcare providers. Holden and Karsh's (2009) model of health information technology usage behavior with implications for patient safety was used to support the literature reviewed and to guide interpretation of the data.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter delineates the techniques employed in the study including the collection and analysis of data relevant to the research question (Polit & Beck, 2012) about doctors and nurses' self-reported perceptions of factors influencing medical error reporting at the Federal University Teaching Hospital, Ido-Ekiti. The reviewed literature in Chapter Two provided an overview of error reporting events in healthcare systems globally, the challenges health professionals face in reporting errors and perceived factors that facilitate error reporting in health sectors. The design and construction of a questionnaire and the validation process are also described as well as the survey population, sample size and criteria for inclusion of respondents. To ensure ethical practice, the principles of the Helsinki Declaration (World Medical Association, 2013) were strictly upheld.

3.2 Research design

A descriptive cross-sectional survey design was employed to achieve the study aims and objectives by providing the "architectural backbone" for the study for selecting an appropriate plan and identifying strategies to minimize bias (Polit & Beck, 2012, p. 58). A descriptive study serves to observe, describe, and document aspects of a situation as it naturally occurs and sometimes serves as a starting point for hypothesis generation or theory development that provides a basis for future quantitative research (Grove, Burns, & Gray, 2014; Polit & Beck, 2012). In this study a descriptive design was used to identify a phenomenon of interest, that is, doctors and nurses' self-reported perceptions of factors influencing medical error reporting, to identify and describe the variables within the phenomenon and to develop conceptual and operational definitions of the variables (Grove, Burns & Gray, 2014). Data collection in cross-sectional studies are collected at one point time from a particular group of respondents (Grove, Burns & Gray, 2014).

3.3 Research site

This study was conducted at the Federal Teaching Hospital, Ido-Ekiti in Ekiti-State, Nigeria. The teaching hospital is one of the medium-sized government-owned health facilities situated in the south-western region of the country. The Federal Medical Centre Ido Ekiti came into being on 19 July, 1998

(FETHI, 2016) and was upgraded to a Teaching hospital status on 15 November, 2015 (FETHI, 2016). The hospital has more than 20 departments and units with a bed capacity exceeding 400 within more than 22 wards and a staff of more than 500 doctors and nurses.

The philosophy of the hospital focuses on reduction to the minimum of morbidity and mortality due to communicable and non-communicable diseases with a view of meeting global targets on the elimination of these diseases and to significantly increase life expectancy and quality of life of the people of Ekiti state and Nigeria in general (Servicom Unit FETHI, 2016). The hospital aims to achieve prompt service delivery with passion, where service providers are polite and friendly. Healthcare services aim at being reliable, affordable, timely, efficient and easily accessible. The hospital functions as a referral center, providing tertiary health services to general and specialists hospitals within and around the same geopolitical zones.

3.4 Study Population

Polit and Beck (2012) described a study population as the specific individuals with common and defining characteristics to whom study results can be generalized. In this study, the population comprised medical doctors (residents, consultants and registrars) and nurses in various specialization fields who met the inclusion criteria and agreed to participate voluntarily after giving voluntary written informed consent as outlined in Appendix A.

3.4.1 Eligibility criteria

Respondents' suitability for inclusion in the study was ascertained before respondents were selected for the study and thereafter randomized (Polit & Beck, 2012).

3.4.1.1 Inclusion criteria

- Doctors and nurses directly involved in patient care in any clinical area/department of the hospital.
- Doctors and nurses who had been practicing as registered professionals for not less than one year who by then might have familiarized themselves with the hospital's error reporting system.

3.4.1.2 Exclusion criteria

- Doctors and nurses in management positions and not providing direct patient care.

3.4.2 Sampling method

To ensure representativeness and a valid sample of the population of doctors and nurses at the Federal Teaching Hospital, a simple random sampling technique was employed to recruit respondents for the study (Suresh, Thomas, & Suresh, 2011). This method was utilized to ensure that each member of the study population had an equal chance or probability of being included in the study and to obtain an unbiased result (Grove et al., 2014). A list of every member of the population (doctors and nurses working in the hospital) was obtained from the hospital's administrative department before using the sampling criteria to define eligible respondents. Each person in the population was identified as the study's sample frame (Grove et al., 2014).

3.4.3 Estimation of sample size

The sample size was determined using Stat Calc (Epi info7, CDC). It was anticipated that not more than 50% of the population surveyed (50% frequency) would be aware of and use an error reporting system, or that they report various types of errors occurring in healthcare, or have an understanding of the barriers to error reporting or factors that facilitate an error reporting culture at the hospital.

The sample size needed for this survey was calculated from a population of N=600 comprising 360 nurses and 240 doctors and based on the following information:

Population of N=600;
95% confidence interval (CI);
5% confidence limit;
margin of error; and
an expected frequency of 50%.

A sample size of n=234 emerged (comprising 94 doctors and 140 nurses).

Machin, Campbell, Tan, and Tan (2009) suggested that when calculating or estimating sample size, the value obtained should be rounded to the nearest 5 or 10 or even more since studies are planned in the presence of uncertainty with respect to the eventual outcome. A total sample of 230 (comprising 90 doctors and 140 nurses) was considered adequate for the survey using the rule of rounding the number down to the nearest ten if the last digit in the number was 1, 2, 3, or 4.

3.5 Data collection: Instrumentation

This section describes the construction of a 5-section survey questionnaire that served as the research instrument for the study (section 3.5.1). Thereafter the questionnaire validation processes were outlined and described: index of content validity (CVI) and face validity (section 3.5.2.1) by four experts and a pilot study (section 3.5.2.2) conducted on 30 respondents for test-retest reliability. The procedure for data collection, methods of data management and analysis are subsequently described.

3.5.1 Construction of questionnaire

A questionnaire was employed as the data collection tool as this is useful for providing a more extensive discussion of the variables of interest (Grove et al., 2014). The justification for use of a questionnaire was based on the research design employed and the stated objectives. The prototype questionnaire (Appendix A) comprised 5 sections (A, B, C, D and E) with a total of 53 questions/item statements from a validated and publicly available instrument that was modified with permission of the authors (Evans et.al, 2006; Heard, Sanderson & Thomas, 2012) who were acknowledged on the questionnaire. The structured questionnaire had the advantage of allowing respondents to self-report their opinion or perception about factors influencing error reporting (Polit & Beck, 2012).

The questionnaire (Sections B to E) contained close-ended item statements with Likert scale response options. Closed-ended questions allowed respondents to choose the response that most closely matched the appropriate answer or that best described their perceptions or feelings from among possible sets of answers (Polit & Beck, 2012). The closed-ended question type was efficient in that respondents were able to complete more closed-ended than open-ended questions in a given time (Polit & Beck, 2012). Two questions on socio-demographic characteristics in Section A of the questionnaire required respondents to provide their age and years of work experience. For data analysis of Section A responses, an alternative scale was used (questions allowed respondents to choose from two or more options such as gender (male or female), profession (nurse or doctor); an agreement scale was used for Section B, D and E questions (Strongly Agree, Agree, Neutral, Disagree and Strongly Disagree); and a frequency scale or rank order-scale was used for Section C (Never, Occasionally, Always) (Grove et al., 2014; Polit & Beck, 2012).

Modification of the questionnaire gave an opportunity to include negatively worded questions in parts of Sections B, D and E of the questionnaire. The rationale for this was to prevent agreement or

acceptance and extreme response biases that arise when participants are allowed to respond only to positively worded questions (Sauro, 2011). Item statements were designed to elicit understanding of respondents' perception of factors influencing reporting behaviour in the hospital. Firstly, respondents were required to give their knowledge and use of error reporting system; secondly, their reporting practice; thirdly, barriers to reporting practice; and finally, facilitating factors to an error reporting culture. Attached to each questionnaire was a self-designed information sheet and consent form that provided detailed information about the study to ensure participation was voluntary and informed.

Section A with six (6) questions dealt with the socio-demographic characteristics of the respondents (gender, age, profession, education level, years of experience, and current working position in the institution) and was developed by the researcher.

Section B covered the level of awareness and use of an error reporting system in the hospital. This section consisted of five (5) item statements rated on a 5-point Likert scale ranging from strongly agree to strongly disagree. Here respondents were asked about the existence of their hospitals' incident reporting system. Item statements were from a validated and publicly available instrument adapted and modified with permission of the authors (Evans et.al, 2006) who were acknowledged on the questionnaire.

Section C focused on the practice of reporting various types of errors in healthcare. Item statements were from a validated and publicly available instrument adapted and modified with permission of the authors (Evans et.al, 2006) who were acknowledged on the questionnaire. To measure reporting practice, doctors and nurses were asked to estimate how often they reported errors. A list of eight (8) common patient incidents/errors representing different common injuries in healthcare were itemized. Respondents provided answers on how often they reported any of these using a 3-point Likert scale (never, occasionally, and always).

Section D was on perceptions of factors that may be barriers to error reporting. The questionnaire provided 15 potential reasons for not reporting incidents and respondents were asked to rate these on a 5-point Likert scale that ranged from 1-5 (strongly agree, agree, neutral, disagree and strongly disagree). Item statements from a validated and publicly available instrument were adapted and modified with permission of the authors (Heard, Sanderson & Thomas, 2012) who were acknowledged on the questionnaire.

Section E consisted of 13 item statements with a focus on perceptions of factors that facilitate error reporting. This section was rated on a 5-point Likert scale. Item statements from a validated and publicly available instrument were adapted and modified with permission of the authors (Heard, Sanderson & Thomas, 2012) who were acknowledged on the questionnaire.

3.5.2 Instrument validation

In this section validation of the questionnaire is described (content and face validity) and reliability by test-retest reliability testing to assess the accuracy of the measurement scales (Bannigan & Watson, 2009, p. 3238).

3.5.2.1 Index of content validity (CVI) and face validity

3.5.2.1.1 Construction of the CVI criterion sheet

To determine whether the prototype 53-item survey questionnaire was valid, an index of content validity (CVI) criterion sheet, instructions and an informed consent form (Appendix B) for use by experts (Table 3-1) were constructed. Each item on the questionnaire was rated on the CVI criterion sheet on a 4-point ordinal rating scale: 1 = irrelevant, 2 = unable to assess relevance without item revision, 3 = relevant but needs minor correction; 4 = extremely relevant (Lynn, 1986; Polit & Beck, 2006). Items with a rating value of 3 or 4 were retained in the questionnaire as evidence of validity (Yaghmale, 2009). Each item on the CVI criterion sheet had a space for including comments and recommendations by the experts. The item with a CVI value of ≥70% agreement of items was accepted as valid (Guttmann, et al., 2006:116).

3.5.2.1.2 Participants and Inclusion criteria

Since the adapted questionnaire had been modified with the permission of the authors (Evans et al., 2006; Heard et al., 2012), validation of the modified questionnaire became necessary. Content validity of the modified or new questionnaire was performed based on the judgement of four experts recruited for the study. The reason for the use of expert was to ensure adequate coverage of the modified questionnaire (Polit & Beck, 2012).

Polit, Beck, and Owen (2007) advocated that 5 or fewer experts will produce an acceptable CVI value for item total correlation. This study invited four experts comprising two doctors and two nurses selected by purposive sampling technique. A maximum variation sampling, a form of purposive sampling that

invite people with diverse background, viewpoints and experiences about error reporting was utilized to select respondent for this validation process (Polit & Beck, 2012).

The experts for the CVI validation process included two doctors (a consultant of community medicine and a resident doctor with more than eight (8) years of practice experience) from Federal Teaching hospital, Ekiti State, Nigeria; a registered professional nurse with over ten (10) years of work experience at the clinical settings from State specialist hospital Osun State, Nigeria; and one Master's-prepared nurse educator from the University of Cape Town, South Africa (Table 3-1). The experts were invited to participate because they had clinical experience in error reporting and/or health sciences research (Jafree, Zakar, Zakar, & Fischer, 2016) but were not part of the main study. Health sciences research is an appropriate criterion for inclusion as a participant for this study as it can include medical or nursing research experience. Both doctors and nurses were invited to participate in the validation process because of the importance of having a good mix in terms of roles and clinical disciplines among CVI experts (Polit & Beck, 2012).

3.5.2.1.3 Recruitment procedure for CVI

The CVI validation process commenced in October 2016 and lasted till December 2016 (7 weeks) due to technical delays on the part of one of the experts. The questionnaire was presented to the experts who possessed knowledge and experience in the area of health sciences evaluation research. Two of the four experts were met and communicated with personally, while the remaining two were communicated with via email. Each participant was provided with a CVI checklist (Appendix B) and accompanying consent form to be signed as an indication of their willingness to participate. Thus returning a completed CVI and a consent form indicated their voluntary approval to participate. Three of the respondents returned the CVI forms within the stipulated period of two weeks whereas the last expert had technical issues that delayed feedback for about one month.

These experts completed and evaluated the questionnaire using the CVI criterion sheet independently of each other. The completed CVI was collected from two of the experts after two (2) weeks and returned by email by two experts. A summary of the validation processes (research activity, sampling method, inclusion/exclusion criteria, respondents and rationale) is presented in Table 3-1.

Table 2-1: Subjects and sampling methods for validation processes

Research activity	Sampling method	Inclusion/exclusion criteria	Respondents	Rationale
Internal validation of Questionnaire using index of content validity (CVI) criteria and criteria for face validity	Purposive sampling	Doctors and nurses with clinical experience in error reporting and/or health sciences research were included but were not part of the main study.	Four clinical and research experts with clinical experience in error reporting: ·a consultant physician ·a Master's-prepared lecturer ·a nurse and a doctor from a clinical setting.	Expert knowledge
Pilot Testing the Survey Questionnaire: Test-retest reliability testing	Random sampling of doctors and nurses (total n=30). Instrument administered on two consecutive occasions at an interval of 2 weeks.	Doctors and nurses directly involved in the patient care process and who have been practicing for not less than a year and were not part of the main study. All units/wards were involved in the study; Respondents who gave written consent to participate in the study (having obtained a copy of the information sheet.	Doctors and nurses in various fields of specialization providing services in all the units/wards.	Measured and established the stability or reproducibility of the questionnaire in terms of degree of agreement among raters.

3.5.2.1.4 Index of content validity (CVI) data management

Data obtained from experts' judgement were entered into IBM SPSS for Windows, version 24. Item statements that achieved a score of ≥70% agreement among the four raters were included. The CVI was determined by how many experts rated each item at 3 or 4 (Lynn, 1986, p. 384; Polit et al., 2007). A value of ≥70% agreement of items was accepted as valid (Guttmann, et al., 2006:116) although a scale is considered to have excellent validity if it is composed of items greater than 0.78 or higher when averaged (Polit & Beck, 2012). Items that did not achieve this score were discarded.

3.7.2.1.5 Results of CVI

Following review of the questionnaire, suggestions and opinions offered by the four experts are given below:

- For Section A of the questionnaire which addressed respondents' socio-demographic characteristics, all items in this section were rated a "four" (extremely relevant) by the four experts and thus remained unchanged.
- For Section B, one expert suggested that the fragment "I do not know" in question 7 be removed and "before" should be added to question 10 of section B. This was discussed with the supervisor and subsequently deleted from Question 7, while question 10 was not changed.

One expert suggested that question 14 in section C should be modified since patient falls could result in minor or major injuries. This question was subsequently modified to "Patient falls with resultant injury". Similarly, as different kinds of diagnostic errors occur in a laboratory, it was suggested that the question be reviewed and stated as "diagnostic errors" and not "diagnostic error". Following discussion with the supervisor, the decision to make these changes was accepted.

One expert suggested that the negatively-worded item statements in sections D and E (Item statements 25, 26, 31, 37, 43, 44, 45, 47 and 53) should be modified to fit reporting barriers and facilitators. In discussion with the supervisor, no changes were made to these item statements as negatively-worded item statements are needed to be included in a survey (Sauro, 2011). A typographical error was identified in Question 35 of section D and was corrected. Other item statements in the questionnaire were found to be adequate and rated as extremely relevant by all the experts and therefore remained unchanged. Thus, the content validity of the questionnaire items was adequately assessed, and the results for each question are presented in Table 3-2.

Table 3-2: Results of CVI: Expert opinion (n=4) on index of content validity (CVI) of each item on the survey questionnaire

Index of Content Validity							
Section/ Item	1=irrelevant	2=unable to assess relevance without item revision or item is in need of such revision that it would no longer be relevant	3= relevant but needs minor correction	4=extremely relevant	Items ranking 3 and 4	Median score for this item [correct all from excel]	Comments
Section A: Socio demographic characteristics of the respondents.							
Item 1: Age	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 2: Gender	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 3: Profession	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 4: Professional qualification	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 5: Work experience	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 6: Work status	0	0	0	4 (100%)	4 (100%)	0	No changes *
Section B: Awareness and use of the incident/error reporting system							
Item 7: system for reporting errors	0	0	1 (25%)	3 (75%)	4 (100%)	0.5	Removal of "I do not know". This change was made. *
Item 8: I know where and when to report	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 9: Never reported an incident	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 10: Have reported an incident	0	0	1 (25%)	3 (75%)	4 (100%)	0.5	Addition of "before" to the end of the statement was suggested – but no change was made after discussions with research supervisor.* #
Item 11: I do not know how to locate an incident form	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 12: I know what to do with a completed form	0	0	0	4 (100%)	4 (100%)	0	No changes * #
Item 13: I do not know who to report an incidence or error to.	0	0	0	4 (100%)	4 (100%)	0	No changes *
Section C Frequency of reporting various types of errors							

Index of Content Validity							
Section/ Item	1=irrelevant	2=unable to assess relevance without item revision or item is in need of such revision that it would no longer be relevant	3= relevant but needs minor correction	4=extremely relevant	Items ranking 3 and 4	Median score for this item [correct all from excel]	Comments
Item 14: patient falls with resultant injury.	0	0	1 (25%)	3 (75%)	4 (100%)	0.5	Patient fall could be a minor or major error depending on the severity, so why not consider modifying the question to "Patient falls with resultant injury". This change was made. * #
Item 15: Wrong drug prescribed and administered	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 16: Wrong treatment or procedure	0	0	0	4 (100%)	4 (100%)	0	No changes * #
Item 17: Equipment fault resulting in patient harm	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 18: Serious error like delay in patients' treatment resulting in death.	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 19: Communication error	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 20: Infection acquired during hospital stay	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 21: Pressure sore acquired during hospital care	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 22: Diagnostic error that can cause serious disability or death	0	0	1 (25%)	3 (75%)	4 (100%)	0.5	There are different kinds of diagnostic errors that can occur in the laboratory, so it should be stated as "diagnostic errors" and not "diagnostic error". This change was made. *
Item 23: Haemolytic reaction	0	0	0	4 (100%)	4 (100%)	0	No changes *

Index of Content Validity							
Section/ Item	1=irrelevant	2=unable to assess relevance without item revision or item is in need of such revision that it would no longer be relevant	3= relevant but needs minor correction	4=extremely relevant	Items ranking 3 and 4	Median score for this item [correct all from excel]	Comments
Section D: Perceived Barriers to Error Reporting							
Item 24: Positive feedback when errors are reported.	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 25: I am not afraid of any adverse consequences	0	0	1 (25%)	3 (75%)	4 (100%)	0.5	Removal of "I am not" and modification to "Fear of adverse..." No changes were made as negatively worded are required. *
Item 26: My colleagues will be unsupportive and cast blame on me.	0	0	1 (25%)	3 (75 %)	4 (100%)	0.5	Complete the statement as "My colleagues will be unsupportive and cast blame on me if errors result from me". No changes were made. *
Item 27: focus is on the individual without looking at organizational/ system errors	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 28: My patient will have trust in me and feel safe in my presence.	0	0	1 (25%)	3 (75%)	4 (100%)	0.5	Addition of "lose" and "unsafe" *
Item 29: The response by supervisors/administrators does not match the severity of the error	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 30: There is no point reporting an error that did not cause harm.	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 31: Making a report is not time consuming.	0	0	1 (25%)	3 (75%)	4 (100%)	0.5	Modify question to "Making a report is time consuming". No change was made as negatively worded items should be included. *

Index of Content Validity							
Section/ Item	1=irrelevant	2=unable to assess relevance without item revision or item is in need of such revision that it would no longer be relevant	3= relevant but needs minor correction	4=extremely relevant	Items ranking 3 and 4	Median score for this item [correct all from excel]	Comments
Item 32: Don't know whose responsibility it is to make a report.	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 33: When l do not consider an incident to be an error	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 34: Error reporting system is not effective in my hospital.	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 35: The form is easy to feel.	0	0	4 (100%)	0	4 (100%)	0	Typographical error. Replacement of the word "feel with fill in" *
Item 36: The task l engage in at work makes me remember to report an error.	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 37: There is confidentiality of errors reported.	0	0	1 (25%)	3 (75%)	4 (100%)	0.5	Modify question to "There is no confidentiality of errors reported." *
Section E: Factors that facilitate error reporting							
Item 38: As long as the staff involved learn from incidents it is unnecessary to discuss them further.	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 39: Generalized feedback	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 40: Individualized feedback to you about reports you submit.	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 41: Role models, e.g. senior colleagues, departmental directors who openly encourage reporting	0	0	0	4 (100%)	4 (100%)	0	No changes *

Index of Content Validity							
Section/ Item	1=irrelevant	2=unable to assess relevance without item revision or item is in need of such revision that it would no longer be relevant	3= relevant but needs minor correction	4=extremely relevant	Items ranking 3 and 4	Median score for this item [correct all from excel]	Comments
Item 42: Legislated protection of information provided from use in litigation.	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 43: Inability to make report anonymously	0	0	2 (50%)	2 (50%)	4 (100%)	1	Statement was modified to "Anyone may report anonymously" Change was made. *
Item 44: Lack of access to paper forms for reporting.	0	0	1 (25%)	3 (75%)	4 (100%)	0.5	Modify question to "Access to paper forms for reporting" No change was made as negatively worded items should be included. * #
Item 45: Lack of support from colleagues.	0	0	1 (25%)	3 (75%)	4 (100%)	0.5	Modify question to "support from colleagues." No change was made as negatively worded items should be included. * #
Item 46: The purpose and implementation of reporting systems should be addressed clearly	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 47: More blame attached to those who report errors	0	0	1 (25%)	3 (75%)	4 (100%)	0.5	Removal of "more but less blame" No change was made as negatively worded items should be included. *
Item 48: Access to computer-based reporting systems from home	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 49: Education about the purpose of reporting.	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 50: Clear guidelines about what adverse events and errors to report	0	0	0	4 (100%)	4 (100%)	0	No changes *

Index of Content Validity							
Section/ Item	1=irrelevant	2=unable to assess relevance without item revision or item is in need of such revision that it would no longer be relevant	3= relevant but needs minor correction	4=extremely relevant	Items ranking 3 and 4	Median score for this item [correct all from excel]	Comments
Item 51: Training on how information should be reported	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 52: Information on how confidentiality will be maintained	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 53: No payment for time taken to report.	0	1 (25%)	1 (25 %)	2 (50%)	3 (75 %)	1	Modify question to "Incentives for time taken to report" This change was made. *
Total numbers of items with this score amongst 212 ratings (1, 2, 3, 4) of 53 items	0	1	19	192	211		
Median of items with this score (IQR)	Cannot be computed+	0 (0)	0 (1)	4 (1)	4 (0)		
Mean of items with this score (SD)	0 (0)	0.02 (0.137)	0.36 (0.710)	3.62 (0.740)	3.98 (0.137)		
Count: experts scoring between 3 and 4 = 52/53							
Count: all respondents where 1+2 =1 = 1/53							
Count: all respondents where 1+2 =2 = 0/53							

Note: A total of four raters each scored 53 items.

* Meets predetermined ≥70% agreement on items ranked between 3 and 4. This item was present on the questionnaire subjected to inter-rater reliability (IRR).

Item was removed from the final questionnaire (Appendix D) following IRR.

+ cannot be computed

SD = standard deviation, IQR = interquartile range.

3.7.2.1.6 Face validity

Face validity of the questionnaire was also determined by the four experts who examined the questionnaire in terms of its layout, format, quality of printing, length, response scales (for Sections A to E), if visually easy to read, if visually easy to comprehend and if instructions at the beginning of the questionnaire were clear and easy to understand, using four criteria (Very skillful, Satisfactory, Needs improvement, Unacceptable) (Kyriacos, 2011). Data in Table 3-3 show the outcome of the review by the four (4) experts.

Table 3-3: Expert opinion on the face validity of items on the questionnaire

	Very skillful	Satisfactory	Needs improvement	Unacceptable	Comments
Layout	0	4(100%)	0	0	No changes
Format	0	4(100%)	0	0	No changes
Quality of printing	0	4(100%)	0	0	No changes
Length of the questionnaire	0	4(100%)	0	0	No changes
The response scale of Section B	1 (25%)	3 (75%)	0	0	No changes
The response scale of Section C	1 (25%)	3 (75%)	0	0	No changes
The response scale of Section D	1 (25%)	3 (75%)	0	0	No changes
The response scale of Section E	1 (25%)	3 (75%)	0	0	No changes
The response scale of Section F	1 (25%)	3 (75%)	0	0	No changes
If visually easy to read	1 (25%)	3 (75%)	0	0	No changes
If visually easy to comprehend	0	4(100%)	0	0	No changes
If instructions at the beginning of the questionnaire are clear and easy to understand	0	4(100%)	0	0	No changes

Adapted with permission from Kyriacos (2011)

All aspects of face validity were rated satisfactory and very skillful by all the experts, thus the layout, format, quality of printing, length and response scales of the questionnaire remained unchanged.

3.5.2.2 Reliability testing

Reliability testing was performed on the questionnaire to determine its ability to produce the same result when measurements were done repeatedly (Karanicolas et al., 2009). The rationale was to ensure that the instrument becomes reproducible when used with a wider population other than those who participated in the study (Bannigan & Watson, 2009).

3.5.2.2.1 Participants and inclusion criteria

Following assessment of content and face validity and modification, the questionnaire was piloted tested for reliability on 30 respondents (n=13 doctors, n=17 nurses) as outlined in Table 3-1 who were not part of the main study.

3.5.2.2.2 Recruitment procedure for IRR

The pilot study was conducted in January, 2017 at the State Specialist Hospital, Asubiaro, Osogbo, Osun State Nigeria in south-west Nigeria and not at the main research site. It is a secondary health care facility that provides both preventive and curative health services therefore, respondents were not part of the main study. The respondents were selected purposively and it was ensured that none of these respondents had participated in content validation.

The questionnaire was distributed with an information sheet and consent form that indicated voluntary participation and informed consent. The respondents completed the questionnaire within 15 – 20 minutes in the presence of the researcher and this afforded them the opportunity to ask questions and get clarification on the questions posed. Ethical considerations (WMA 2013) were strictly upheld. The questionnaires were retrieved immediately after completion and the process was repeated two weeks later. The responses obtained from the pilot study formed the basis for the final questionnaire adopted for this study.

3.5.2.2.3 Data management for inter-rater reliability (IRR) testing

A test-retest reliability method was utilized to determine the quality of the questionnaire (Polit & Beck, 2012) as it measured the stability in terms of degree of agreement, that is, the extent to which the observer rating the questionnaire (Sections A to E) at an interval of two weeks achieved similar results (Karanicolas et al., 2009), that is in the correlation between the two scores (Julius & Chris, 2005). A weighted kappa was employed as it calculates agreement for two or more observers (n=30 respondents in the pilot study) and with two or more categories of responses that are commonly ordered such as a severity score of 1 to 4

(Karanicolas et al., 2009). The Likert scale in sections B to E of the final questionnaire is an ordinal-type of scale with five categories, therefore ordinal variables apply and the data were therefore treated as categorical variables. Karanicolas et al. (2009, p. 103) reported that the Kappa coefficient as a statistical measure accounts for chance agreement in categorical responses by comparing the observed agreement with the possible agreement beyond chance. This form of agreement yields a maximum value of 1.0 (indicative of perfect agreement) and 0.0 (indicative of no agreement beyond chance).

The 53 item questionnaire were subjected to rating by the 30 raters and a Kappa value of 0.70 or greater was considered acceptable for the pilot study. The completed survey items were entered into IBM SPSS 24 to calculate the IRR. May et al., (2010:3) gave the classification of Kappa values based on agreement obtained beyond chance as:

Slight agreement 0.00-0.20;
Fair agreement 0.21-0.41;
Moderate agreement 0.41-0.60;
Substantial agreement 0.61-0.80;
Almost perfect agreement 0.81-0.99; and
Perfect agreement 1.0.

3.5.2.2.4 Result/Findings of inter-rater reliability (IRR) testing

Karanicolas et al. (2009) reported that time lapses between the ratings for test-retest reliability could bring about some changes in the characteristics measurement being tested and it was found that six (6) items on the questionnaire were rated differently by the same rater after an interval of two (2) weeks. Karanicolas et al. (2009) reported that many researchers have proposed different standards or guidelines for reporting or interpreting reliability estimates of an instrument. A value of 0.60 is minimally acceptable, and that values of 0.75 or higher are very good (Polit & Beck, 2012).

The test-retest reliability results of this study conducted at an interval of two weeks showed that six (6) items (Questions 10, 12, 14, 16, 44 & 45) had a low kappa value of less than 0.7 and were considered inappropriate for the set value. Three items with Kappa values within the range of 0.67 – 0.69 were rounded up to 0.7 and were retained, while six items that were less than 0.7 were found to be unacceptable and discarded.

Section A that focuses on the socio-demographic characteristics of the respondents revealed kappa values of 1.0, indicative of perfect agreement (Karanicolas et al., 2009).
In section B which reported on the awareness and use of an error reporting system, item 10 and 12 with weighted kappa values of 0.619 and 0.631 respectively were excluded as they could not achieve almost perfect or perfect agreement of 0.7 proposed by Karanicolas and his colleagues.

Two (2) items in Section C, question 14 and 16 with kappa values of 0.539 and 0.636 were excluded as they could not achieve a value of 0.7 proposed as agreement for this study.

All the items in section D had weighted kappa values ranging from 0.719 - 1.00, indicative of almost perfect and perfect agreements.

Section E of the questionnaire revealed almost perfect agreement with the exception of items 44 and 45 with kappa values of 0.461 and 0.401. These values were not found useful for this study and discarded since they are less than the stipulated agreement value of ≥ 0.7. Table 3-4 showed the summary of the pilot study conducted on 30 raters over two time period.

Table 3-4: Pilot study on (N=30) respondents showing responses to Section A-E of a 53 item questionnaire conducted over two time periods

No.	Item	Number (%)	Weighted Kappa Value	Z	P Value	95% CI	Comments
1	What is your age?	30 (100)	1.000	8.498	0.000	1.000 - 1.000	Item was retained
2	What is your gender?	30 (100)	1.000	5.477	0.000	1.000 - 1.000	Item was retained
3	What is your profession?	30 (100)	1.000	5.477	0.000	1.000 - 1.000	Item was retained
4	What is your professional qualification?	30 (100)	1.000	6.781	0.000	1.000 - 1.000	Item was retained
5	How many years of work experience have you?	30 (100)	1.000	8.338	0.000	1.000 - 1.000	Item was retained
6	What is your current work status?	30 (100)	1.000	7.375	0.000	1.000 - 1.000	Item was retained
7	This hospital has a system for reporting errors	30 (100)	0.915	6.504	0.000	0.792 - 1.037	Item was retained
8	I know where and when to report	30 (100)	1.000	7.678	0.000	1.000 - 1.000	Item was retained
9	I have never reported an incident or error I was involved in	30 (100)	0.730	5.887	0.000	0.488 - 0.973	Item was retained
10	I have reported an incident committed by a colleague	30 (100)**	0.619	4.960	0.000	0.352 - 0.885	Item was discarded
11	I do not know how to locate an incident form	30 (100)	0.765	6.325	0.000	0.550 - 0.979	Item was retained
12	I know what to do with a completed form	≠29 (96.7)**	0.631	4.815	0.000	0.386 – 0.877	Item was discarded
13	I do not know who to report an incidence or error to	≠29 (96.7)	0.822	6.301	0.000	0.665 – 0.979	Item was retained
14	Patient falls with resultant injury	30 (100)**	0.539	4.003	0.000	0.230 – 0.848	Item was discarded
15	Wrong drug prescribed and administered requiring treatment and prolong hospitalization	≠29 (96.7)	1.000	6.574	0.000	1.000 - 1.000	Item was retained
16	Patient received wrong treatment or procedure	≠29 (96.7)**	0.636	4.547	0.000	0.367 – 0.925	Item was discarded
17	Equipment fault resulting in patient harm	≠29 (96.7)	0.898	6.127	0.000	0.757 – 0.038	Item was retained
18	Serious error like delay in patients' treatment resulting in death	30 (100)	0.717	4.914	0.000	0.472 – 0.962	Item was retained

No.	Item	Number (%)	Weighted Kappa Value	Z	P Value	95% CI	Comments
19	Communication error resulting in breach of patients' confidentiality	≠29 (96.7)	0.748	5.027	0.000	0.528 – 0.967	Item was retained
20	Infection acquired during hospital stay	≠29 (96.7)	1.000	7.326	0.000	1.000 – 1.000	Item was retained
21	Pressure sore acquired during hospital care	30 (100)	0.678	5.070	0.000	0.462 – 0.894	Item was retained
22	Diagnostic errors that can cause serious disability or death	≠29 (96.7)	0.837	5.810	0.000	0.684 – 0.989	Item was retained
23	Haemolytic reaction due to the administration of ABO-incompatible blood or blood products	30 (100)	1.000	6.473	0.000	1.000 – 1.000	Item was retained
24	There is positive feedback when errors are reported	30 (100)	0.822	6.738	0.000	0.676 – 0.968	Item was retained
25	I am not afraid of any adverse consequences of making a report such as litigation	30 (100)	1.000	6.690	0.000	1.000 – 1.000	Item was retained
26	My colleagues will be unsupportive and cast blame on me	≠29 (96.7)	0.921	7.177	0.000	0.836 – 1.007	Item was retained
27	When an error occurs, much focus is on the individual without looking at organizational /system errors	30 (100)	0.856	6.775	0.000	0.721 – 0.990	Item was retained
28	My patient will lose trust in me and feel unsafe in my presence	≠29 (96.7)	0.973	6.941	0.000	0.919 – 1.028	Item was retained
29	The response by supervisors/administrators does not match the severity of the error	30 (100)	1.000	7.912	0.000	1.000 – 1.000	Item was retained
30	There is no point reporting an error that did not cause harm	≠29 (96.7)	1.000	7.627	0.000	1.000 – 1.000	Item was retained
31	Making a report is not time consuming	30 (100)	1.000	7.076	0.000	1.000 – 1.000	Item was retained
32	When I don't know whose responsibility it is to make a report	≠29 (96.7)	0.914	7.377	0.000	0.817 – 1.010	Item was retained
33	When I do not consider an incident to be an error	≠27 (90.0)	0.856	6.866	0.000	0.716 – 0.995	Item was retained
34	Error reporting system is not effective in my hospital	30 (100)	0.817	6.779	0.000	0.707 – 0.927	Item was retained
35	The form is easy to fill in	≠29 (96.7)	0.917	7.911	0.000	0.829 – 1.004	Item was retained
36	The task I engage in at work makes me remember to report an error	≠29 (96.7)	0.737	5.561	0.000	0.547 – 0.927	Item was retained
37	There is no confidentiality of errors reported	30 (100)	0.800	6.566	0.000	0.656 – 0.944	Item was retained

No.	Item	Number (%)	Weighted Kappa Value	Z	P Value	95% CI	Comments
38	As long as the staff involved learn from incidents it is unnecessary to discuss them further	≠29 (96.7)	0.719	5.713	0.000	0.579 - - 0.860	Item was retained
39	Generalized feedback about reports received from the hospital reporting system	30 (100)	0.726	4.489	0.000	0.500 - -0952	Item was retained
40	Individualized feedback to you about reports you submit	≠29 (96.7)	0.914	6.693	0.000	0.820 – 1.009	Item was retained
41	Role models e.g. senior colleagues, departmental directors who openly encourage reporting	30 (100)	0.741	6.247	0.000	0.564 – 0.918	Item was retained
42	Legislated protection of information provided from use in litigation	≠26 (86.7)	0.749	5.796	0.000	0.548 – 0.950	Item was retained
43	Anyone may report anonymously	30 (100)	0.757	6.339	0.000	0.596 – 0.918	Item was retained
44	Lack of access to paper forms for reporting	≠29 (96.7)**	0.461	4.129	0.000	0.212 – 0.710	Item was discarded
45	Lack of support from colleagues	30 (100)**	0.401	4.195	0.000	0.156 – 0.646	Item was discarded
46	The purpose and implementation of reporting systems should be addressed clearly	30 (100)	0.866	7.019	0.000	0.707 – 1.025	Item was retained
47	More blame attached to those who report errors	30 (100)	0.926	7.226	0.000	0.851 – 1.001	Item was retained
48	Access to computer-based reporting systems from home, phone, or hotline reporting	30 (100)	0.708	4.133	0.000	0.408 – 1.007	Item was retained
49	Education about the purpose of reporting	30 (100)	0.691	4.860	0.000	0.413 – 0.969	Item was retained
50	Clear guidelines about what adverse events and errors to report and who should report	≠29 (96.7)	0.715	4.411	0.000	0.482 – 0.948	Item was retained
51	Training on how information should be reported and what should be done with reports	30 (100)	0.691	4.909	0.000	0.445 – 0.936	Item was retained
52	Information on how confidentiality will be maintained if you supply your name	30 (100)	0.738	4.102	0.000	0.482 – 0.994	Item was retained
53	Incentive for time taken to report	30 (100)	0.788	5.886	0.000	0.676 – 0.899	Item was retained

Note to table: Confidence interval computed in IBM Spss24; Items with weighted kappa value ≥ 0.7 were accepted and tagged 'item was retained'; ** Item not meeting an acceptable kappa value for the study and thus discarded; ≠ for missing value.

Validation provided evidence that the survey questionnaire was reliable and the measurement scale had stability as it showed substantial to excellent agreement on two separate occasions for most of the items:

Substantial agreement 0.61-0.80	22 items but 3 items in this range were discarded = 19
Almost perfect agreement 0.81-0.99	14 items
Perfect agreement 1.0	14 items
Total	47/53

Therefore 47 of 53 original questions/item statements were utilized for data collection in the main survey. Six (6) items were discarded as they failed to meet the pre-determined ≥70% agreement. So too, was the questionnaire found to be valid in terms of the degree to which the scale measured what it was intended to measure, that is, the perceptions of the respondents with regard to error reporting barriers. In this study content validity whether a scale has included all the relevant and excluded irrelevant issues in terms of its content (Polit & Beck, 2012). That is it ensures that appropriate sample of items for the construct are being measured and adequately covers the construct domain (Polit & Beck, 2012).

3.6 Data collection procedure

3.6.1 Gaining access

After obtaining written approval from the University of Cape Town's Faculty of Health Sciences Human Research Ethics Committee (HREC REF: 675/2016), approval was also sought in writing from the Ethics and Research Committee of the Federal Teaching Hospital, Ido (FETHI) (ERC/2016/11/08/61B) and State Specialist Hospital, Asubiaro, Osogbo, Osun State, (HREC/27/04/2015/SSHO/028) Nigeria.

3.6.2 Recruitment for participation

The data collection process commenced on 5th February 2017 and lasted until 5th March following written approval from the hospital (Appendix G). An appointment was booked to meet with the heads of each nursing unit/department and the Chairman, Medical Advisory Committee in charge of medical doctors' affairs in the hospital. Information about the study was provided and a list of staff with more than 1 year of work experience was requested. The researcher explained that privacy, autonomy and

confidentiality of study respondents and information provided would be maintained during the course of the study and during dissemination of findings.

The staff list was obtained from the hospital's administrative department and potential respondents for the survey were recruited by simple random sampling technique. Due to staff rotation in each unit/department from time to time, a more concise list that gave the years of work experience was obtained from the heads of each department and matron of each unit/ward. The names obtained were subsequently transferred onto a Microsoft Excel spreadsheet 2013 version and a randbetween function was used to generate eligible respondents for this survey.

A simple random technique was used to select respondents for the study using computer generated random numbers of the Randbetween function in Excel® to generate names of eligible staff who met the study inclusion criteria and staff on three shifts were sampled. Doctors and nurses on annual and maternity leave also had the opportunity to participate. Eligible candidates were then invited to participate in the study by using a work roster of eligible respondents so that those on afternoon and night shift were accessed and sampled.

On each day of recruitment, an information sheet (Appendix A) that explained the aims and purpose of the study was given to each respondents (doctors and nurses) and they were encouraged to ask questions. The researcher also indicated her credentials as a registered nurse who possessed a Bachelor of Nursing Science (BNSc) certificate and who had practiced in various wards and units of two hospitals and had about 10 years of work experience. Respondents were assured of confidentiality and anonymity of information provided and also encouraged to ask questions when they needed clarification. Thereafter, each questionnaire containing each participant's code number and a consent form were handed over to each participant and cross-referenced on the researcher's list. This was done to ensure they had good knowledge of the research process and that they were participating voluntarily. The majority of the respondents were eager to collect the questionnaire after reading the information sheet with verbal comments like "your topic is interesting, it is a challenge we have in this hospital".

Respondents were informed that the questionnaire was not meant to be shared for the period of data collection and that it required honest completion from memory. This was to prevent respondents from sourcing information and sharing views before the completion of the questionnaire.
Respondents who were unable to complete the questionnaire in the researcher's presence were afforded the opportunity to complete the questionnaire at their leisure to prevent undue interruption to their work

schedule and were requested to drop it in a box clearly marked as "COMPLETED QUESTIONNAIRES FOR O. AFOLALU'S PROJECT" in a specified area of the ward after completion. The researcher returned to each research site every two days to collect the questionnaires from the boxes and names were ticked off. Those who had not submitted their completed questionnaires were reminded to do so and after 4 weeks, which was the expected duration of the study, all boxes were collected from all the units.

3.7 Data management and statistical analysis

The returned questionnaires were numbered consecutively from 1 to 90 for doctors and 91 to 230 for nurses. The questions were coded in consultation with a statistician and the raw data were captured directly onto a password protected IBM SPSS software spreadsheet (version 24, 2016) for coding, cleaning and analysis. Reverse coding was done for negatively worded items on the questionnaire where the Likert scale was used (Hutton, 2017). Reverse coding or scoring was done in a way that the numerical scoring on the questionnaire's Likert scale from strongly agree=1 to strongly disagree= 5 was run in the opposite direction (Hutton, 2017; Sauro, 2011). Questionnaire items recoded include: item statements 9, 10, 11, 20, 21, 27, 31, 32, 34 & 41. At the completion of the study data were copied onto a CD for safekeeping in a secure environment for 3 years. Data were analyzed using descriptive and inferential statistics as outlined in Table 3-5. A significance level of 0.05 was assigned for all statistical analyses.

Table 3-5: Statistical analysis

Socio-demographic variables	Indicator variables	Data	Statistical analysis
Age		Interval	Frequency, Mean, min-max, SD – if data are normally distributed otherwise median and interquartile range, Independent sample t-test (mean difference, 95% Confidence Interval, P-value, t-statistic, df, F-value)
Gender	Female=1, male=0	Nominal/ categorical	Frequency/Proportion, Percentage, Chi-Square or Fisher's exact test, df, P-value
Profession	Nurse=1, doctor=0	Nominal/ categorical	Frequency/Proportion, Percentage, Chi-Square/ Fisher's Exact test, df, P-value
Professional qualification	Nursing diploma, Bachelor of nursing, MBBS, Masters/PhD	Nominal/ categorical	Frequency/Proportion, Percentage, Chi-Square/ Fisher's Exact test, df, P-value
Work experience in years		Interval	Frequency, Mean, min-max, Standard deviation, Independent Sample t-test (mean difference, 95% CI, P-value, t-statistic, df, F-value)
Current work status	Part-time, Full-time	Nominal/ categorical	Number, Proportion, Chi-Square/Fisher's Exact test, df, P-value
Awareness and use of an error reporting system	7 pre-listed options	Ordinal Categorical Likert scale	Median
Frequency of reporting various types of errors	10-pre-listed	Ordinal/ Categorical Likert scale	Median
Factors that serve as barriers to error reporting		Ordinal/ Categorical Likert scale	Median
Perceptions of factors that facilitate error reporting		Ordinal/ Categorical Likert scale	Median

3.8 Ethical considerations

Ethical approval of this study was obtained from the University of Cape Town Department of Health and Rehabilitation Sciences, the Faculty of Health Sciences Human Research Ethics Committee (HREC REF: 675/2016, Appendix F) and from the FETHI (Appendix G) before commencement of data collection. Permission for access was verbally from the Heads of each unit/department to approach respondents. Respondents gave written consent to provide data (Appendix A). Consent was also obtained from authors Holden and Karsh (2009) to use their conceptual framework.

The principles of the Helsinki Declaration which recognize national and international ethical, legal and regulatory norms and standards describe the conduct expected of a researcher when dealing with human

subjects and were upheld to protect the rights of doctors and nurses recruited for the study and rights of others in the setting (Grove et al., 2014; World Medical Association, 2013). Therefore, the researcher also ensured that respondents' right to justice, dignity, integrity, self-determination, autonomy, safety, privacy (confidentiality and anonymity), non-maleficence (protection from harm), fair treatment and veracity were strictly adhered to (World Medical Association, 2013).

The development and validation of the locally conducted questionnaire as well as the conduct of the actual study did not require patient participation, instead a survey of nurses and doctors elicited perceptions of factors influencing error reporting. Therefore, standards to generate new knowledge in this research never took precedence over the rights and interests of individual subjects (doctors and nurses) recruited for the study.

3.8.1 Benefits and Risks

Since the study was not intended to test the clinical skill or ability of respondents but to seek their opinions of factors influencing error reporting, there were no overt risks, adverse effects or hazards attached to the study for respondents. Respondents participated by expressing their opinions of their own volition. There were no physical risks. An important anticipated or desired outcome of the study was to identify and possibly eliminate barriers that prevent doctors and nurses from reporting errors which could in turn foster safety reporting of incidents and in the long run could promote patient safety. Respondents were not offered any incentive or remuneration for taking part in the study.

3.8.2 Vulnerable Groups and Individuals

There were no vulnerable groups or individuals in the study of healthcare professionals' perceptions. Doctor and nurse respondents with more than one year of professional experience as registered healthcare professionals were considered to have greater authority and autonomy than students and information about the study was provided to respondents who were then given the opportunity to participate willingly.

3.8.3 Privacy and Confidentiality

Every precaution was taken to protect the privacy, anonymity and confidentiality of the information provided by respondents by allocating a code number for each one on their questionnaire. Respondents' answers to the questionnaire could not be linked to them. The hospital's management team and heads of

wards and units were not provided with information collected from the respondents nor were names of respondents disclosed. Raw data from the questionnaires were captured directly onto a password protected IBM SPSS software spreadsheet. Hard copies of documents such as signed consent forms were kept in a secure location and only made accessible to the researcher. Names or personal identifying information of respondents were not made available or linked to the results of this study.

3.8.4 Consent

The respondents were adults who agreed to participate voluntarily and were informed of the right to refuse to participate in the study or withdraw consent to participate at any time without reprisal. The researcher gave a brief introduction of self to remove fear and to avoid respondents' feeling of compulsion to participate. Respondents were not deceived or forced into making a decision to participate. Written consent was obtained from each respondents before completing questionnaire (Appendix A). All information was provided in English as this is the official language of Nigeria. The researcher distributed the information sheet (which explained the study aims, objectives, types of questions, benefits, risks and how study findings will be disseminated) to participants. After ensuring that respondents had understood the contents of the information sheet, a voluntary written informed consent was sought by the researcher.

3.8.5 Beneficence and Non-maleficence

The principle of beneficence which minimizes harm and maximizes benefits to study respondents was strictly upheld (Polit & Beck, 2012). Respondents were assured that information provided will only be used for the research purpose and will not expose them to job sanction. They were treated with respect, care and addressed as individuals with rights rather than mere research subjects. The researcher avoided the possibility of causing physical and psychological harm to the respondents by informing them prior to the study commencement not to disclose any information they were not comfortable to give. Also, the research was carried out in the respondents' natural work-based setting (hospital) to facilitate recall of medical error reporting.

3.9 Summary

The chapter described the research methodology, design (descriptive cross-sectional study using a survey method) and justifications for each aspect of the method used. Simple random sampling technique was utilized to select respondents for the study. Ethics approval was sought and granted. A 53-item

questionnaire was developed following review of relevant literature and validated by CVI and IRR, followed by modification of the questionnaire and a reduction of 53 to 47 item statements before administration of the research instrument. Two hundred and thirty (230) questionnaires were distributed and returned. Thoughtfulness was given to ensure respondents' rights were protected before, during and after the study. Findings of the study are presented in the next chapter.

CHAPTER FOUR

RESULTS

4.1 Introduction

The main aim of this study was to describe doctors' and nurses' self-reported perceptions of factors influencing error reporting in one Nigerian hospital, the Federal Teaching Hospital Ido-Ekiti (FETHI). A descriptive cross-sectional design was employed to achieve the study aim and objectives. A 47-item survey questionnaire elicited respondents' opinions about factors influencing medical error reporting at the hospital. This chapter presents the results of the survey questionnaire in accordance with the stated objectives. The questionnaire comprised five (5) sections:

Section A: Socio-demographic characteristics of the respondents
Section B: Awareness and use of error reporting system in the hospital
Section C: Frequency of reporting various types of errors
Section D: Factors that serve as barriers to error reporting
Section E: Factors that facilitate an error reporting culture at the hospital.

4.2 Response rate

Two hundred and thirty (N=230) questionnaires were distributed to doctors (n=90) and nurses (n=140) at FETHI and all were returned (100%). Missing values were dealt with by transforming and recoding; a value of -1 was used to replace the missing data. Of the 47 questions/item statements, ten items in sections B, D and E of the questionnaire (9, 10, 11, 20, 21, 27, 31, 32, 34 & 41) were reverse coded (Appendix E); of the ten items, five were negatively worded and five were considered to have a negative connotation such as "There is positive feedback when errors are reported" (item 20).

4.3 Objective 1: To describe and compare nurses and doctors' socio-demographic characteristics

Summary descriptive data of respondents' (N=230) socio-demographic characteristics are presented in Tables 4-1 – 4-2 by age, gender, profession, professional qualifications, years of work experience and current work status.

4.3.1 Age

Data for respondents' age are shown in Table 4-1 (n=230; response n=208, 90.4%).

Table 4-1 Respondents' (N=230) age in years

Variable	Characteristics	Number responded (%)	Median	Interquartile range	Minimum-Maximum
Age *	<25	3 (1.3)	36	8	25 - 59
	26-30	35 (15.2)			
	31-35	58 (25.2)			
	36-40	58 (25.2)			
	41-45	32 (13.9)			
	46-50	15 (6.5)			
	51-55	5 (2.2)			
	56-60	2 (0.9)			
	Total	**208 (90.4%)**			

Note to table:
*missing data (n=22, 9.6%)
IQR=interquartile range.

Data in Table 4-1 show that the majority of respondents (n=116/208, 50.4%) were within the age range of 31-40 years. The minimum-maximum age of respondents was 25-59 years. Data for age were not normally distributed (Shapiro-Wilk $P<0.001$) therefore the median was used (36) with an interquartile range of 8. Data showing differences in respondents' age by profession are shown in Table 4-2.

Table 3-2: Differences in respondents' (N=230) age by profession

Respondents' age* in years					Mann-Whitney U-test				
Profession	**Number of responses for age (%)**	**Median**	**min-max**	**IQR**	**Mean Rank**	**Sum of Ranks**	**U-value**	**Z-value**	***P*-value**
Nurses	123 (53.5)	35	25-59	9	100.97	12419.00	4793.00	-1.02	0.308
Doctors	85 (36.9)	36	25-57	8	109.61	9317.00			

Note to table:
A significance level of 0.05 was assigned
*missing data (n=22, 9.6%)
IQR=interquartile range.

Data in Table 4-2 show that the majority of the respondents (123/230, 53.5%) were nurses. Data for age were not normally distributed for nurses (P=0.003) or doctors (P=0.005) so the median was taken indicating an older population of doctors (36 years) than nurses (35 years) but the difference was not statistically significant (U= 4793, P= 0.308).

4.3.2 Socio-demographic characteristics (gender, profession, qualification, years of work experience, current work status: full versus part-time)

Data for respondents' socio-demographic characteristics are shown in Table 4-3.

Table 4-3: Summary of respondents' (N=230) socio-demographic data

Characteristics	Number (%)
Gender	
Males	84 (36.5)
Females	146 (63.5)
Profession	
Nurse	140 (60.9)
Doctor	90 (39.1)
Professional qualification	
Nursing Diploma	92 (40.0)
Bachelor of Nursing Science	48 (20.9)
MBBS/MD/MOD	81 (35.2)
Masters/PhD	9 (3.9)
*Years of work experience	
1 year - 5 years	40 (17.8)
6 years - 10 years	94 (40.9)
11 years - 15 years	49 (21.3)
16 years - 20 years	29 (12.6)
21 years - 25 years	8 (3.5)
26 years - 30 years	4 (1.7)
31 years - 35 years	1 (0.4)
Current work status	
Part-time	10 (4.3)
Full-time	220 (95.7)

Note to table:
* Years of work experience (n=225/230, 97.8%) responses; (n=5, 2.2%) missing data)
MBBS = Bachelor of Medicine and Bachelor of Surgery, MD/ MOD = Doctor of Medicine.

Data in Table 4-3 show that the majority of respondents were female (n=146/230, 63.5%) and nurses (n=140/230, 60.9%). The majority of nurses had a diploma in nursing (n=92/140 (65.7%). None of the nurses reported having a Master's degree or PhD whereas 9/90 (3.9%) doctors did. Data show that of the 97.8% (n=225/230) of respondents for this question the majority 94 (40.9) had 6-10 years of work experience. The majority of the respondents (n=220/230, 95.7%) were in full-time employment.

Data showing differences between nurses and doctors' socio-demographic characteristics are shown in Table 4-4 to Table 4-5.

Table 4-4: Differences between nurses and doctors' (N=230) socio-demographic characteristics

Characteristics	Nurses (n=140) Number (%)	Doctors (n=90) Number (%)	X^2 (value)	*P*-value (df)
Gender				
Female	115 (50.0)	31 (13.5)	Pearson Chi-Square 53.76	<0.001 (1)
Male	25 (10.9)	59 (25.7)		
Professional qualification				<0.001 (1)
Nursing Diploma	92 (40.0)	0 (0.0%)	Fisher's exact test 291.29	
Bachelor of Nursing Science	48 (20.9)	0 (0.0%)		
MBBS/MD/MOD	0 (0.0%)	81 (35.2)		
Masters/PhD	0 (0.0%)	9 (3.9)		
Current work status				0.001 (1)
Part-time	1 (0.4)	9 (3.9)	Fisher's exact	
Full-time	139 (60.4)	81 (35.2)		

Note to table:
A significance level of 0.05 was assigned
MBBS = Bachelor of medicine and bachelor of surgery, MD/ MOD = Doctor of Medicine.
df- degree of freedom.

Data in Table 4-4 show that the majority of nurses (n=115, 50.0%) were female while most of the doctors (n=59, 25.7%) were male. The gender difference between the two groups was statistically significant, $X^2(1, n=230) = 53.76$, $P<0.001$.

The majority of nurses reported having a diploma in nursing (n=92, 40.0%) compared to those having a Bachelor of Nursing Science degree (n=48, 20.9%). The majority of doctors (n=81, 35.2%) reported having a MBBS/MD/MOD as their professional qualification while a few (n=9, 3.9) had a Masters or PhD degree. Differences in the professional qualifications between doctors and nurses were statistically significant $X^2(1, n=230) = 291.29$, $P<0.001$.

The majority of nurses (n=139/140, 60.4%) and doctors (n=81/90, 35.2%) were in full-time employment. The difference in current work status between the two groups was statistically significant $X^2(1, n=230)$, $P=0.001$.

Data showing differences in respondents' years of work experience by profession are shown in Table 4-5.

Table 4-5: Differences in respondents' (N=230) years of work experience by profession

Respondents' years of work experience*					Mann-Whitney U-test				
Profession	**Number of responses (%)**	**Median**	**min-max**	**IQR**	**Mean Rank**	**Sum of Ranks**	**U-value**	**Z-value**	***P*-value**
Doctors	90 (40)	9	1-28	6	96.64	16727.50	4602.500	-3.09	0.002
Nurses	135 (53.5)	10	2-32	8	123.91	8697.50			

Note to table:
A significance level of 0.05 was assigned
*missing data (n=5, 2.2%)

Data in Table 4-5 show that the minimum to maximum number of years of work experience for nurses was 2–32 years (median=10, IQR 8), while for doctors this was 1-28 years (median=9, IQR 6).The difference in years of work experience between the two groups was statistically significant (n=225, *U*= 4602.5, *P*= 0.002).

4.4 Objective 2: To describe and compare doctors and nurses' self-reported level of awareness and use of an error reporting system

Data in Table 4-6 present a descriptive analysis of respondents' overall self-reported level of awareness and use of an error reporting system for section B (Items 7 to 11) of the questionnaire.

Table 4-6: Respondents' (n=230) overall self-reported awareness of and use of an incident/error reporting system

Characteristics	**Number of responses (%)**	**Median score* (IQR)**
This hospital has a system for reporting errors (item statement 7)	230 (100%)	3 (2)
I know where and when to report (item statement 8)	230 (100%)	2 (2)
I have never reported an incident or error I was involved in (item statement 9)	229 (99.6%)∩	3 (2)
I do not know how to locate an incident form (item statement 10)	228 (99.1%)≠	3(2)
I do not know who to report an incident or error to (item statement 11)	230 (100%)	4 (2)

Note to table: * The median is taken as the Likert scale data is ordinal level.
∩missing data (n=1, 0.4%)
≠missing data (n=2, 0.9%)

Four of the five item statements in Table 4-6 report on knowledge of reporting systems whereas item 9 deals with self-reporting behaviour. Data in Table 4-6 show that on a Likert scale of 1 (strongly agree) to 5 (strongly disagree) where 3 is 'neutral', the median score was 3 for two of the four knowledge item statements (7 and 10) indicating that respondents seemed unsure about whether the hospital had a system for reporting errors and how to locate an incident form. This uncertainty (median score of 3) is also reflected in respondents' self-reported behavior (Item 9). However, for Item 8 "I know where and when to report" the median score was 2 (agree) and for Item 11 "I do not know who to report an incident or error to" the median score was 4 (disagree), indicating that respondents were more confident about where and when to report, but not confident of who to report an incidence or errors to.

Data showing comparisons in respondents' awareness and use of an error reporting system by profession are shown in Table 4-7.

Table 4-7: Comparing awareness and use of an error reporting system by profession

Characteristics		**Doctors n=90 Number (%)**	**Nurses n=140 Number (%)**	**Total Number n=230 (%)**	**X^2 (value)**	***P-value* (df)**
This hospital has a system for reporting errors	Strongly Agree	13 (14.4)	16 (11.4)	29 (12.6)	Pearson Chi-square (13.302)	0.010 (4)
	Agree	16 (17.8)	56 (40.0)	72 (31.3%)		
	Neutral	11 (12.2)	10 (7.1)	21 (9.1%)		
	Disagree	40 (44.4)	49 (35.0)	89 (38.7%)		
	Strongly disagree	10 (11.1	9 (6.4%)	19 (8.3%)		
I know where and when to report	Strongly Agree	15 (16.7)	16 (11.4)	31 (13.5%)	Fisher's exact (23.843)	<0.001
	Agree	18 (20.0)	68 (48.6)	86 (37.4%)		
	Neutral	12 (13.3)	21 (15.0)	33 (14.3%)		
	Disagree	38 (42.2)	31 (22.1)	69 (30.0%)		
	Strongly disagree	7 (7.8)	4 (2.9)	11 (4.8%)		
*I have never reported an incident or error I was involved in *(reverse coding)*	Strongly Agree	15 (16.7)	20 (14.4)	35 (15.3%)	Pearson Chi-square (3.212)	0.523 (4)
	Agree	35 (38.9)	44 (31.7)	79 (34.5%)		
	Neutral	11 (12.2)	15 (10.8)	26 (11.3%)		
	Disagree	23 (25.6)	51 (36.7)	74 (32.3%)		
	Strongly disagree	6 (6.7)	9 (6.5)	15 (6.6%)		
≠I do not know how to locate an incident form *(reverse coding)*	Strongly Agree	14 (15.7)	15 (10.8)	29 (12.7%)	Pearson Chi-square (9.842)	0.043 (4)
	Agree	32 (36.0)	32 (23.0)	64 (28.1%)		
	Neutral	11 (12.4)	15 (10.8)	26 (11.4%)		
	Disagree	28 (31.5)	60 (43.2)	88 (38.6%)		
	Strongly disagree	4 (4.5)	17 (12.2)	21 (9.2%)		
I do not know who to report an	Strongly Agree	16 (17.8)	13 (9.3)	29 (12.6%)	Pearson Chi-square (11.845)	0.019 (4)
	Agree	22 (24.4)	18 (12.9)	40 (17.4%)		
	Neutral	8 (8.9)	10 (7.1)	18 (7.8%)		

Characteristics		Doctors n=90 Number (%)	Nurses n=140 Number (%)	Total Number n=230 (%)	X^2 (value)	*P-value* (df)
incidence or error to *(reverse coding)*	Disagree	33 (36.7)	72 (51.4)	105 (45.7%)		
	Strongly disagree	11 (12.2)	27 (19.3)	38 (16.5%)		

Note to table:
A significance level of 0.05 was assigned
*missing data (n=1, 0.4%)
≠missing data (n=2, 0.9%)

Item statement 7: This hospital has a system for reporting errors

Data in Table 4-7 show that the majority of respondents (n=89/230, 38.7%) disagreed that the hospital had a system in place for reporting errors but more nurses (56/140, 40.0%) than doctors (16/90, 17.8%) were aware of such a system. The difference in level of awareness between doctors and nurses regarding the hospital's incident reporting system was statistically significant $X^2(4, n=230) = 13.302$, $P<0.010$).

Item statement 8: I know where and when to report

The majority of respondents (n=86/230, 37.4%) agreed on knowing where and when to report errors, of whom 48.6% (n=68/140) were nurses and 20.0% (n=18/90) doctors; the difference in responses between the two groups was statistically significant $X^2(n=230) = 23.843$, $P<0.001$.

Item statement 9: I have never reported an incident or error I was involved in *(reverse coding)*

The majority of respondents (n=79/229, 34.5%) agreed that they had never reported an incident or error that they were involved in, of whom doctors comprised a larger proportion (n=35/90, 38.9%) than nurses (n=44/139, 31.7%); the difference in responses between the groups was not statistically significant $X^2(4, n=229) =3.212$, $P=0.523$.

Item statement 10: I do not know how to locate an incident form *(reverse coding)*

The majority of respondents (n=88/288, 38.6%) disagreed that they did not know how to locate an incident form, of whom nurses comprised a larger proportion (n=60/139, 43.2%) than doctors (n=28/89, 31.5%); the difference in responses between the groups was statistically significant $X^2(4, n=228) = 9.842$, $P=0.043$.

Item statement 11: I do not know who to report an incidence or error to *(reverse coding)*

The majority of respondents (n=105/230, 45.7%) disagreed that they did not know who to report an incident or error to, of whom nurses comprised a larger proportion (n=72/140, 51.4%) than doctors (n=33/90, 36.7%); the difference in responses between the groups was statistically significant $X^2(4, n=230) = 11.845$, $P=0.019$.

4.5 Objective 3: To describe and compare the frequency of reporting various types of errors among doctors and nurses

Data describing respondents' overall self-reported frequency of reporting various types of errors for section C (Items 12 to19) of the questionnaire are shown in Table 4-8; the table presents median value for three-point Likert scale in section C of questionnaire.

Table 4-8: The median of Likert scale for Frequency of reporting various types of errors by profession

Characteristics	Number (%)	Median[Ω] (IQR)
Wrong drug prescribed and administered requiring treatment and prolonging hospitalization (Q12)	230 (100%)	2 (1)
Equipment fault resulting in patient harm (Q13)	227 (98.7%)^	2 (1)
Serious error like delay in patients' treatment resulting in death (Q14)	230 (100%)	2 (1)
Communication error resulting in breach of patients' confidentiality (Q15)	230 (100%)	2 (1)
Infection acquired during hospital stay (Q16)	229 (99.6%)+	2 (1)
Pressure sore acquired during hospital care (Q17)	230 (100%)	2 (1)
Diagnostic errors that can cause serious disability or death (Q18)	223 (97.0%)*	2 (1)
Haemolytic reaction due to the administration of ABO-incompatible blood or blood products (Q19)	228 (99.1%) #	2 (1)

Note to table: ΩThe median is taken as the Likert scale data is ordinal level.
^missing data (n=3, 1.3%)
+missing data (n=1, 0.4%)
*missing data (n=7, 3.0%)
#missing data (n=2, 0.9%)

Data in Table 4-8 depict the respondents' reporting practice. On a Likert scale of 1 (never) to 3 (always) where 2 is 'occasionally', the median value of 2 for all 8 items (12 to 19) indicates that the majority of respondents only occasionally reported the listed types of incidents. Data showing respondents' reporting practice by profession are shown in Table 4-9 using the Pearson chi-square *P*-value to indicate significance.

Table 4-9: A comparison of respondents' reporting practice for types of errors by profession

Characteristics		Doctors n=90 Number (%)	Nurses n=140 Number (%)	Total Number n=230 (%)	X^2 (value)	*P-value* (df)
Wrong drug prescribed and administered requiring treatment and prolonging hospitalization	Never	48 (53.3)	55 (39.3)	103 (44.8%)	Pearson Chi-square taken (4.678)	0.096 (2)
	Occasional	26 (28.9)	57 (40.7)	83 (36.1%)		
	Always	16 (17.8)	28 (20.0)	44 (19.1%)		
^Equipment fault resulting in patients' harm	Never	40 (44.9)	56 (40.6)	96 (42.3%)	Pearson Chi-square taken (0.703)	0.704 (2)
	Occasional	30 (33.7)	54 (39.1)	84 (37.0%)		
	Always	19 (21.3)	28 (20.3)	47 (20.7%)		
Serious error like delay in patients' treatment resulting in death	Never	49 (54.4)	51 (36.4)	100 (43.5%)	Pearson Chi-square taken (9.312)	0.010 (2)
	Occasional	21 (23.3)	58 (41.4)	79 (34.3%)		
	Always	20 (22.2)	31 (22.1)	51 (22.2%)		
Communication error resulting in breach of patients' confidentiality by profession	Never	38 (42.2)	51 (36.4)	89 (38.7%)	Pearson Chi-square taken (1.159)	0.560 (2)
	Occasional	36 (40.0)	57 (40.7)	93 (40.4%)		
	Always	16 (17.8)	32 (22.9)	48 (20.9%)		
+Infection acquired during hospital stay	Never	31 (34.8)	43 (30.7)	74 (32.3%)	Pearson Chi-square taken (2.582)	0.275 (2)
	Occasional	42 (47.2)	80 (57.1)	122 (53.3%)		
	Always	16 (18.0)	17 (12.1)	33 (14.4%)		
Pressure sore acquired during hospital care	Never	35 (38.9)	46 (32.9)	81 (35.2%)	Pearson Chi-square taken (3.484)	0.175 (2)
	Occasional	38 (42.2)	76 (54.3)	114 (49.6%)		
	Always	17 (18.9)	18 (12.9)	35 (15.2%)		
*Diagnostic errors that can cause serious disability or death	Never	36 (40.4)	62 (46.3)	98 (43.9%)	Pearson Chi-square taken (1.954)	0.376 (2)
	Occasional	36 (40.4)	42 (31.3)	78 (35.0%)		
	Always	17 (19.1)	30 (22.4)	47 (21.1%)		
≠Haemolytic reaction due to the administration of ABO-incompatible blood or blood products	Never	35 (38.9)	49 (35.5)	84 (36.8%)	Pearson Chi-square taken (0.280)	0.869 (2)
	Occasional	31 (34.4)	51 (37.0)	82 (36.0%)		
	Always	24 (26.7)	38 (27.5)	62 (27.2%)		

Note to table
A significance level of 0.05 was assigned
^missing data (n=3, 1.3%)
+missing data (n=1, 0.4%)
*missing data (n=7, 3.0%)
#missing data (n=2, 0.9%)

Item statement 12: Wrong drug prescribed and administered requiring treatment and prolonging hospitalization

Data in Table 4-9 show that the majority of respondents (n=103/230, 44.8%) had never reported wrong drugs that had been prescribed and administered requiring treatment and prolonged hospitalization of patients, of whom doctors comprised a larger proportion (48/90, 53.3%) than nurses (n=55/140, 39.3%); the difference in responses between the two groups was not statistically significant $X^2(2, n=230) = 4.678$, $P=0.096$.

Item statement 13: Equipment fault resulting in patient harm

The majority of respondents (n=96/227, 42.3%) had never reported faulty hospital equipment that resulted in patient harm, of whom doctors comprised a larger proportion (n=40, 44.9%) than nurses (n=56, 40.6%); the difference in responses between the two groups was not statistically significant, $X^2(2, n=227) = 0.703$, $P=0.704$.

Item statement 14: Serious error like delay in patients' treatment resulting in death

The majority of respondents (100/230, 43.5%) had never reported serious errors such as delays in patients receiving treatment that resulted in death, of whom doctors comprised a larger proportion (n=49/90, 54.4%) than nurses (n=51/140, 36.4%); the difference in responses between the two groups was statistically significant, $X^2(2, n=230) = 9.312$, $P=0.010$.

Item statement 15: Communication error resulting in breach of patients' confidentiality by profession

The majority of respondents (n=93/230, 40.4%) occasionally reported communication errors resulting in breach of patient confidentiality, of whom nurses comprised a marginally larger proportion (n=57/140, 40.7%) than doctors (n=36/90, 40.0%); the difference in responses between the two groups was not statistically significant, $X^2(2, n=230) = 1.159$, $P=0.560$.

Item statement 16: Infection acquired during hospital stay

The majority of respondents (n=122/229, 53.3%) occasionally reported hospital acquired infections, of whom nurses comprised a larger proportion (n=80/140, 57.1%) than doctors (n=42/89, 47.2%). Furthermore, of the (n=74/229, 32.3%) respondents who reported never reporting this type of error,

30.7% (n=43/140) were nurses compared to 34.8% (n=31/89) of doctors. The difference in responses between the two groups was not statistically significant, $X^2(2, n=229) = 2.582$, $P=0.275$.

Item statement 17: Pressure sore acquired during hospital care

The majority of respondents (n=114/230, 49.6%) occasionally reported pressure sores acquired during hospital care, of whom nurses comprised a larger proportion (n=76/140, 54.3%) than doctors (n=38/90, 42.2%). Furthermore, of the 15.2% (n=35/230) of respondents who always reported pressure sores that developed during the period of hospitalization, doctors comprised a larger proportion (18.9%, n=17) than nurses (12.9%, n=18/140). The difference in responses between the two groups was not statistically significant, $X^2(2, n=230) = 3.484$, $P=0.175$.

Item statement 18: Diagnostic errors that can cause serious disability or death

The majority of respondents (98/223, 43.9%) never reported diagnostic errors that can cause serious disability or death, of whom nurses comprised a larger proportion (n=62/134, 46.3%) than doctors (n=36/89, 40.4%). The difference in responses between the two groups was not statistically significant $X^2(2, n=223) = 1.954$, $P=0.376$.

Item statement 18: Haemolytic reaction due to the administration of ABO-incompatible blood or blood products

The majority of respondents (n=84/228, 36.8%) never reported haemolytic reactions due to the administration of ABO-incompatible blood or blood products, of whom doctors comprised a larger proportion (n=35/90, 38.9%) than nurses (n=49/138, 35.5%). The difference in responses between the two groups was not statistically significant, $X^2(2, n=228) = 0.280$, $P=0.869$.

4.5 Objective 3: To describe and compare doctors' and nurses' perceptions of factors that serve as barriers to error reporting

Data describing respondents' overall self-reported perceptions of factors that are barriers to error reporting for section D (Items 20 to 34) of the questionnaire are shown in Table 4-10.
Table 4-10 present the median score for section D of the questionnaire.

Table 4-10: Computing the median of Likert scale for perceived barriers to error reporting

Characteristics	Number (%)	•Median (IQR)
There is positive feedback when errors are reported (item 20)	230 (100%)	2 (1)
I am not afraid of any adverse consequences of making a report such as litigation (Q21)	228 (99.1%)Ω	3 (1)
My colleagues will be unsupportive and cast blame on me (item 22)	229 (99.6%)*	3 (1)
When an error occurs, much focus is on the individual without looking at organization/ system errors (item 23)	230 (100%)	2 (1)
My patient will lose trust in me and feel unsafe in my presence (item 24)	230 (100%)	2 (1)
The response by supervisors does not match the severity of the error (item 25)	223 (97.0%)∑	2 (1)
There is no point reporting an error that did not cause harm (item 26)	229 (99.6%)*	4 (1)
Making a report is not time consuming (item 27)	227 (98.7%)∩	3 (1)
When I don't know whose responsibility it is to make a report (item 28)	227 (98.7%)∩	3 (1)
When l do not consider an incident to be an error (item 29)	226 (98.3%)^	3 (1)
Error reporting system is not effective in my hospital (item 30)	230 (100%)	2 (1)
The form is easy to fill in (item 31)	225 (97.8%)¥	3 (1)
The task l engage in at work makes me remember to report an error (item 32)	225 (97.8%) ¥	3 (1)
There is no confidentiality of errors (item 33)	227 (98.7%)∩	2 (1)
As long as the staff involved learn from incident, it is unnecessary to discuss them further (item 34)	228 (99.1%)Ω	4 (1)

Note to table: • The median is taken as the Likert scale data is ordinal level.
Ωmissing data (n=2, 1.3%)
*missing data (n= 1, 0.4%)
∑missing data (n=7, 3.0%)
∩missing data (n=3, 1.3%)
^missing data (n=4, 1.7%)
¥missing data (n=5, 2.2%)

Data in Table 4-10 report on respondents' perceived barriers to error reporting showing that on a Likert scale of 1 (strongly agree) to 5 (strongly disagree) where 2 is 'Agree', the median score of 2 for 6 of 15 items (20, 23, 24, 25, 30 and 33) indicates that the majority of respondents agreed that the following variables serve as barriers to error reporting:

- Positive feedback when an error is reported (this item statement has a negative connotation and was reverse coded so the statement might not have been understood); when an error occurs, much focus is on the individual; my patient will lose trust in me; the response by supervisors

does not match the severity of the error; error reporting system is not effective; and there is no confidentiality of errors.

Data in Table 4-10 show that on a Likert scale of 1 (strongly agree) to 5 (strongly disagree) where 3 is 'Neutral', the median score of 3 for 7 of 15 items (21, 22, 27, 28, 29, 31 and 32) showed that the majority of respondents seemed to be unsure about the following variables serving as barriers to error reporting:

- I am not afraid of any adverse consequences; my colleagues will be unsupportive; making a report is not time consuming; when I don't know whose responsibility; when l do not consider an incident; the form is easy to fill in; the task l engage in at work.

Data in Table 4-10 show that on a Likert scale of 1 (strongly agree) to 5 (strongly disagree) where 4 is 'Disagree', the median score of 4 for 2 of 15 items (26 and 34) showed that the majority of respondents disagreed that the following variables served as barriers to error reporting:

- As long as the staff involved learn from incident, it is unnecessary to discuss them further; there is no point reporting an error that did not cause harm.

Therefore, data in Table 4-10 indicate that the majority of the respondents had a neutral perception about some variables that may be barriers to error reporting.

Data showing comparisons in respondents' perceived barriers to error reporting by profession are shown in Table 4-11. The Pearson chi-square *P*-value was used to indicate statistical significance.

Table 4-11: Comparing perceived barriers to error reporting by profession

Characteristics		**Doctors n=90 Number (%)**	**Nurses n=140 Number (%)**	**Total Number n=230 (%)**	**X^2 (value)**	***P-value*** **(df)**
There is positive feedback when errors are reported *(reverse coding)*	Strongly Agree	19 (21.1)	26 (18.6)	45 (19.6%)	Fisher's exact taken (10.939)	0.026
	Agree	24 (26.7)	61 (43.6)	85 (37.0%)		
	Neutral	14 (15.6)	22 (15.7)	36 (15.6%)		
	Disagree	25 (27.8)	28 (20.0)	53 (23.0%)		
	Strongly disagree	8 (8.9)	3 (2.1)	11 (4.8%)		
≠I am not afraid of any adverse consequences of making a report such as litigation *(reverse coding)*	Strongly Agree	8 (8.9)	15 (10.9)	23 (10.1%)	Pearson chi-square taken (3.999)	0.406 (4)
	Agree	29 (32.2)	57 (41.3)	86 (37.7%)		
	Neutral	24 (26.7)	29 (21.0)	53 (23.2%)		
	Disagree	21 (23.3)	31 (22.5)	52 (22.8%)		
	Strongly disagree	8 (8.9)	6 (4.3)	14 (6.1%)		
*My colleagues will be unsupportive and cast blame on me	Strongly Agree	18 (20.0)	21 (15.1)	39 (17.0%)	Fisher's exact taken (1.608)	0.820
	Agree	22 (24.4)	41 (29.5)	63 (27.5%)		
	Neutral	18 (20.0)	27 (19.4)	45 (19.6%)		
	Disagree	27 (30.0)	44 (31.7)	71 (31.0%)		
	Strongly disagree	5 (5.6)	6 (4.3)	11 (4.8%)		
When an error occurs, much focus is on the individual without looking at organizational/system errors	Strongly Agree	26 (28.9)	38 (27.1)	64 (27.8%)	Fisher's exact taken (7.891)	0.090
	Agree	41 (45.6)	78 (55.7)	119 (51.7%)		
	Neutral	10 (11.1)	11 (7.9)	21 (9.1%)		
	Disagree	7 (7.8	12 (8.6%)	19 (8.3%)		
	Strongly disagree	6 (6.7%)	1 (0.7)	7 (3.0%)		
My patient will lose trust in me and feel unsafe in my presence	Strongly Agree	16 (17.8)	26 (18.6)	42 (18.3%)	Pearson Chi-square taken (8.576)	0.073 (4)
	Agree	38 (42.2)	49 (35.0)	87 (37.8%)		
	Neutral	12 (13.3)	14 (10.0)	26 (11.3%)		
	Disagree	23 (25.6)	36 (25.7)	59 (25.6%)		
	Strongly disagree	1 (1.1)	15 (10.7)	16 (7.0%)		
ΣThe response by supervisor/administrators does not match the severity of error	Strongly Agree	19 (21.6)	21 (15.6)	40 (17.9%)	Fisher's exact taken (1.754)	0.796
	Agree	34 (38.6)	57 (42.2)	91 (40.8%)		
	Neutral	14 (15.9)	23 (17.0)	37 (16.6%)		
	Disagree	19 (21.6)	32 (23.7)	51 (22.9%)		
	Strongly disagree	2 (2.3)	2 (1.5)	4 (1.8%)		
*There is no point reporting an error that did not cause harm	Strongly Agree	9 (10.0)	10 (7.2%)	19 (8.3%)	Pearson Chi-square was taken (9.618)	0.047 (4)
	Agree	14 (15.6%)	47 (33.8%)	61 (26.6%)		
	Neutral	11(12.2)	15 (10.8)	26 (11.4%)		
	Disagree	40 (44.4)	50 (36.0)	90 (39.3%)		
	Strongly disagree	16 (17.8)	17 (12.2)	33 (14.4%)		
∩Making a report is not time consuming	Strongly Agree	6 (6.7)	14 (10.1)	20 (8.8%)	Pearson Chi-	0.002 (4)
	Agree	20 (22.5)	62 (44.9)	82 (36.1%)		

Characteristics		**Doctors n=90 Number (%)**	**Nurses n=140 Number (%)**	**Total Number n=230 (%)**	**X^2 (value)**	***P-value*** **(df)**
(reverse coding)	Neutral	10 (11.2)	16 (11.6)	26 (11.5%)	square was taken (17.327)	
	Disagree	42 (47.2)	39 (28.3)	81 (35.7%)		
	Strongly disagree	11 (12.4)	7 (5.1)	18 (7.9%)		
∩When I don't know whose responsibility it is to make a report	Strongly Agree	14 (15.6)	14 (10.2)	28 (12.3%)	Pearson Chi-square taken (4.517)	0.340 (4)
	Agree	21 (23.3)	30 (21.9)	51 (22.5%)		
	Neutral	23 (25.6)	35 (25.5)	58 (25.6%)		
	Disagree	30 (33.3)	47 (34.3)	77 (33.9%)		
	Strongly disagree	2 (2.2	11 (8.0)	13 (5.7%)		
^When I do not consider an incident to be an error	Strongly Agree	11 (12.5)	14 (10.1)	25 (11.1%)	Pearson Chi-square taken (0.555)	0.968 (4)
	Agree	28 (31.8)	45 (32.6)	73 (32.3%)		
	Neutral	21 (23.9)	37 (26.8)	58 (25.7%)		
	Disagree	22 (25.0)	34 (24.6)	56 (24.8%)		
	Strongly disagree	6 (6.8)	8 (5.8	14 (6.2%)		
Error reporting system is not effective in my hospital	Strongly Agree	23 (25.6)	34 (24.3)	57 (24.8%)	Fisher exact taken (4.531)	0.339
	Agree	25 (27.8)	43 (30.7)	68 (29.6%)		
	Neutral	19 (21.1)	24 (17.1)	43 (18.7%)		
	Disagree	18 (20.0)	37 (26.4)	55 (23.9%)		
	Strongly disagree	5 (5.6)	2 (1.4)	7 (3.0%)		
¥The form is easy to fill in *(reverse coding)*	Strongly Agree	4 (4.5)	15 (10.9)	19 (8.4%)	Pearson Chi-square was taken (9.926)	0.042 (4)
	Agree	14 (15.9)	29 (21.2)	43 (19.1%)		
	Neutral	26 (29.5)	49 (35.8)	75 (33.3%)		
	Disagree	35 (39.8)	30 (21.9)	65 (29.0%)		
	Strongly disagree	9 (10.2)	14 (10.2)	23 (10.2%)		
¥The task I engage in at work makes me remember to report an error *(reverse coding)*	Strongly Agree	6 (6.9)	13 (9.4)	19 (8.4%)	Pearson Chi-square taken (7.745)	0.101 (4)
	Agree	18 (20.7)	50 (36.2%)	68 (30.2%)		
	Neutral	25 (28.7)	27 (19.6)	52 (23.1%)		
	Disagree	26 (29.9)	32 (23.2)	58 (25.8%)		
	Strongly disagree	12 (13.8)	16 (11.6)	28 (12.4%)		
∩There is no confidentiality of errors reported	Strongly Agree	18 (20.7)	31 (22.1)	49 (21.6%)	Fisher's exact taken (11.697)	0.019
	Agree	27 (31.0)	62 (44.3)	89 (39.2%)		
	Neutral	22 (25.3)	16 (11.4)	38 (16.7%)		
	Disagree	18 (20.7)	21 (15.0)	39 (17.2%)		
	Strongly disagree	2 (2.3)	10 (7.1)	12 (5.3%)		
♎As long as the staff involved learn from incidents it is unnecessary to discuss them further *(reverse coding)*	Strongly Agree	8 (8.9)	18 (13.0)	26 (11.4%)	Pearson Chi-square was taken (20.777)	<0.001 (4)
	Agree	13 (14.4)	55 (39.9)	68 (29.8%)		
	Neutral	10 (11.1)	10 (7.2)	20 (8.8%)		
	Disagree	42 (46.7)	40 (29.0)	82 (36.0%)		
	Strongly disagree	17 (18.9)	15 (10.9)	32 (14.0%)		

Note to table
A significance level of 0.05 was assigned
♎missing data (n=2, 1.3%)
*missing data (n=1, 0.4%)
∑missing data (n=7, 3.0%)
∩missing data(n= 3, 1.3%)
^missing data (n=4, 1.7%)
¥missing data (n=5, 2.2%)

Item statement 20: There is positive feedback when errors are reported *(reverse coding)*

The majority of respondents (n=85/230, 37.0%) agreed that there is positive feedback when errors are reported, of whom nurses comprised a larger proportion (n=61/140, 43.6%) than doctors (n=24/90, 26.7%); the difference between the two groups was statistically significant X^2(n=230) = 10.939, P=0.026. The question is about perceptions of barriers to reporting errors/incidents so interpretation of data for this item statement (discussed in Chapter 5) should be cautiously interpreted.

Item statement 21: I am not afraid of any adverse consequences of making a report such as litigation *(reverse coding)*

The majority of respondents (n=86/228, 37.7%) agreed that they were not afraid of any adverse consequences of making a report such as litigation, of whom nurses comprised a larger proportion (n=57/138, 41.3%) than doctors (n=29/90, 32.2%); the difference between the two groups was not statistically significant X^2(4, n=228) = 3.999, P=0.406. The question is about perceptions of barriers to reporting errors/incidents so interpretation of data for this item statement (discussed in Chapter 5) should be cautiously interpreted.

Item statement 22: My colleagues will be unsupportive and cast blame on me

The majority of respondents (n=102/229, 44.5%) agreed and strongly agreed that they do not report errors because their colleagues will be unsupportive and cast blame on them, of whom nurses comprised a larger proportion (n=62/139, 44.6%) than doctors (n=40/90, 44.4 %); the difference between the two groups was not statistically significant X^2(n=229) = 1.608, P=0.820.

Item statement 23: When an error occurs, much focus is on the individual without looking at organizational/system errors

The majority of respondents (n=119/230, 51.7%) agreed that individuals are the focus when an error occurs rather than the organization, of whom 55.7% (n=78/140) were nurses and 45.6% (n=41/90)

doctors; the difference between the two groups was not statistically significant X^2(n=230) = 7.891, *P*=0.090.

Item statement 24: My patient will lose trust in me and feel unsafe in my presence

The majority of respondents (n=87/230, 37.8%) agreed that errors are not reported due to the fact that patients will lose trust in them and feel unsafe with their presence if they know about their errors, of whom doctors comprised a larger proportion (n=38/90, 42.2%) than nurses (n=49/140, 35.0%); the difference in responses between the groups was not statistically significant X^2(4, n=230) = 8.576, *P*=0.073.

Item statement 25: The response by supervisor/administrators does not match the severity of error

The majority of respondents (n=91/223, 40.8%) agreed that supervisors or administrators' response does not match the severity of error, of whom nurses comprised a larger proportion (n=57/135, 42.2%) than doctors (n=34/88, 38.6%); the difference in responses between the groups was not statistically significant X^2(n=223) = 1.754, *P*=0.796.

Item statement 26: There is no point reporting an error that did not cause harm

The majority of respondents (n=90/229, 39.3%) disagreed that there was no point reporting an error that did not cause harm, of whom more doctors comprised a larger proportion (n=40/90, 44.4%) than nurses (n=50/139, 36.0%); the difference in responses between the groups was statistically significant X^2(4, n=229) = 9.618, *P=0.*047.

Item statement 27: Making a report is not time consuming *(reverse coding)*

The majority of respondents (n=102/227, 44.9%) agreed and strongly agreed that making a report was not time consuming, of whom 55.1% (n=76/138) were nurses and (n=26/89, 29.2%) doctors; the difference in responses between the groups was statistically significant X^2(4, n=227) = 17.327, *P*=0.002.

Item statement 28: When I don't know whose responsibility it is to make a report

The majority of respondents (n=77/227, 33.9%) disagreed with not knowing whose responsibility it is to make a report, of whom nurses comprised a larger proportion (n=47/137, 34.3%) than doctors

(n=30/90, 33.3%); the difference in responses between the groups was not statistically significant $X^2(4, n=227) = 4.517$, $P=0.340$.

Item statement 29: When l do not consider an incident to be an error

The majority of respondents (n=73/226, 32.3%) agreed that errors are not reported when they do not consider an incident to be an error, of whom nurses comprised a larger proportion (n=45/138, 32.6%) than doctors (n=28/88, 31.8%); the difference in responses between the groups was not statistically significant, $X^2(4, n=226) = 0.555$, $P=0.968$.

Item statement 30: Error reporting system is not effective in my hospital

The majority of respondents (n=68/230, 29.6%) agreed that the hospital's error reporting system was not effective, of whom nurses comprised a larger proportion (n=43/140, 30.7%) than doctors (n=25/90, 27.8%) of doctors; the difference in responses between the groups was not statistically significant $X^2(n=230) = 4.531$, $P=0.339$.

Item statement 31: The form is easy to fill in *(reverse coding)*

The respondents (n=75/225, 33.33%) were unsure if error reporting forms were easy to fill in; however, majority of the respondents (n=88/225, 39.1%) disagreed that the form was easy to fill in. Data in Table 4-11 revealed that of the 75 respondents who had neutral opinions about this item, majority were nurses (n=49/137, 35.8%) compared to doctors (n=26/88, 29.5%); the difference in responses between the groups was statistically significant $X^2(4, n=225) = 9.926$, $P=0.042$.

Item statement 32: The task l engage in at work makes me remember to report an error *(reverse coding)*

The majority of respondents (n=68/225, 30.2%) agreed that the task they engage in at work makes them remember to report an error. Also data in Table 4-11 showed that (n=58/225, 25.8%) respondents disagreed with this question. Data in the table show an obvious inconsistency in the responses of doctors and nurses to this item; the difference in responses between the groups was not statistically significant $X^2(4, n=225) = 7.745$, $P=0.101$.

Item statement 33: There is no confidentiality of errors reported

The majority of respondents (n=89/227, 39.2%) agreed that lack of confidentiality of errors reported is a barrier to error reporting, of whom nurses comprised a larger proportion (n=62/140, 44.3%) than doctors (n=27/87, 31.0%); the difference in responses between the groups was statistically significant X^2(n=227) = 11.697, *P*=0.019.

Item statement 33: As long as the staff involved learn from incidents it is unnecessary to discuss them further *(reverse coding)*

The majority of respondents (n=82/228, 36.0%) disagreed that it was unnecessary to further discuss errors once staff involved has learnt from error, of whom doctors comprised a large proportion (n=42/90, 46.7%) than nurses (n=40/138, 29.0%); the difference in responses between the groups was statistically significant X^2(4, n=228) = 20.777, *P*<0.001.

4.6 Objective 4: To describe and compare doctors' and nurses' perceptions of factors that facilitate an error reporting culture at the hospital

Data describing respondents' overall self-reported perceptions of factors that facilitate an error reporting culture for section E (Items 35 to 47) of the questionnaire are shown in Table 4-12.
Table 4-12 presents the median value for section E of questionnaire.

Table 4-12: Computing the median of Likert scale for perceived factors that facilitate an error reporting culture

Characteristics	Number (%)	^Median (IQR)
Generalized feedback about reports received from the hospital reporting system (Q35)	228 (99.1%)≠	2 (1)
Individualized feedback to you about reports you submit (Q36)	228 (99.1%)≠	2 (1)
Role models, e.g. departmental directors who openly encourage reporting (Q37)	227 (98.7%)Σ	2 (1)
Legislated protection of information provided from use in litigation (Q38)	226 (98.3%)∫	2 (1)
Anyone may report anonymously (Q39)	225 (97.8%)◊	2 (1)
The purpose and implementation of reporting systems should be addressed clearly (Q40)	228 (99.1%)≠	2 (1)
More blame attached to those who report errors (Q41)	228 (99.1%)≠	4 (1)
Access to computer-based reporting systems from home, phones or hotline reporting (Q42)	226 (98.3%∫	2 (1)
Education about the purpose of reporting (Q43)	225 (97.8%)◊	2 (1)

Characteristics	Number (%)	^Median (IQR)
Clear guidelines about what adverse events and errors to report and who should report (Q44)	228 (99.1%)≠	2 (1)
Training on how information should be reported and what should be done with reports (Q45)	229 (99.6%)≙	2 (1)
Information on how confidentiality will be maintained if you supply your name (Q46)	227 (98.7%)∑	2 (1)
Incentives for time taken to report (Q47)	224 (97.4%)•	2 (1)

Note to table: ^ The median is taken as the Likert scale data is ordinal level.
≠missing data (n=2, 0.9%)
∑missing data (n=3, 1.3%)
∫missing data (n=4, 1.7%)
◊missing data (n=5, 2.2%)
≙missing data (n=1, 0.4%)
•missing data (n=6, 2.6%)

Data in Table 4-12 report on respondents' perceived factors that facilitate error reporting. Data in the table showed that on a Likert scale of 1 (strongly agree) to 5 (strongly disagree) where 2 is 'Agree', the median value of 2 for 12 of 13 items (35 to 40 and 42 to 47) depicts the majority of respondents agreed that the variables in Table 4-12 can facilitate an error reporting culture in the hospital. However, for Item 41 "More blame attached to those who report errors" the median value was 4, indicating that the majority of respondents disagreed that attaching more blames to those who report errors will not facilitate error reporting.

Data showing comparisons in respondents' perceived factors that facilitate error reporting by profession are shown in Table 4-13. Pearson chi-square and Fisher's exact test were undertaken to show the differences in factors that facilitate error reporting among doctors and nurses.

Table 4-13: Comparing perceived factors that facilitate an error reporting culture by profession

Characteristics		Doctors n=90 Number (%)	Nurses n=140 Number (%)	Total Number n=230 (%)	X^2 (value)	*P-value* (df)
≠Generalized feedback about reports received from the hospital reporting system	Strongly Agree	31 (34.8)	35 (25.2)	66 (28.9%)	Fisher's exact taken (9.309)	0.052
	Agree	28 (31.5)	63 (45.3)	91 (39.9%)		
	Neutral	15 (16.9)	20 (14.4)	35 (15.3%)		
	Disagree	13 (14.6)	11 (7.9)	24 (10.5%)		
	Strongly disagree	2 (2.2)	10 (7.2)	12 (5.3%)		
	Strongly Agree	29 (32.6)	31 (22.3)	60 (26.3%)		0.050

Characteristics		**Doctors n=90 Number (%)**	**Nurses n=140 Number (%)**	**Total Number n=230 (%)**	**X^2 (value)**	***P-value*** **(df)**
≠Individualized feedback to you about reports you submit	Agree	30 (33.7)	62 (44.6)	92 (40.4%)	Fisher's exact taken (9.229)	
	Neutral	15 (16.9)	31 (22.3)	46 (20.2%)		
	Disagree	14 (15.7)	10 (7.2)	24 (10.5%)		
	Strongly disagree	1 (1.1)	5 (3.6)	6 (2.6%)		
✡ Role models, e.g. senior colleagues, departmental directors who openly encourage reporting	Strongly Agree	34 (38.2)	41 (29.7)	75 (33.0%)	Pearson chi-square taken (3.888)	0.274
	Agree	34 (38.2)	71 (51.4)	105 (46.3%)		
	Neutral	13 (14.6)	17 (12.3)	30 (13.2%)		
	Disagree	8 (9.0)	9 (6.5)	17 (7.5%)		
∫Legislated protection of information provided from use in litigation	Strongly Agree	31 (34.8)	35 (25.5)	55 (29.2%)	Fisher exact taken (8.971)	0.053
	Agree	25 (28.1)	53 (46.0)	88 (38.9%)		
	Neutral	24 (27.0)	29 (21.2)	53 (23.5%)		
	Disagree	6 (6.7)	9 (6.6)	15 (6.6%)		
	Strongly disagree	3 (3.4)	1 (0.7)	4 (1.8%)		
◊Anyone may report anonymously	Strongly Agree	20 (22.5)	37 (27.2)	57 (25.3%)	Fisher exact taken (2.011)	0.756
	Agree	35 (39.3)	58 (42.6)	93 (41.3%)		
	Neutral	16 (18.0)	21 (15.4)	37 (16.4%)		
	Disagree	16 (18.0)	18 (13.2)	34 (15.1%)		
	Strongly disagree	2 (2.2)	2 (1.5)	4 (1.8%)		
≠The purpose and implementation of reporting systems should be addressed clearly	Strongly Agree	37 (41.6)	52 (37.4)	89 (39.0%)	Fisher exact taken (5.362)	0.230
	Agree	38 (42.7)	76 (54.7)	114 (50.0%)		
	Neutral	10 (11.2)	7 (5.0)	17 (7.5%)		
	Disagree	3 (3.4)	3 (2.2)	6 (2.6%)		
	Strongly disagree	1 (1.1)	1 (0.7)	2 (0.9%)		
≠More blame attached to those who report errors *(reverse coding)*	Strongly Agree	3 (3.4)	14 (10.1)	17 (7.5%)	Pearson chi-square taken (4.413)	0.353
	Agree	18 (20.2)	28 (20.1)	46 (20.2%)		
	Neutral	15 (16.9)	22(15.8)	37 (16.2%)		
	Disagree	35 (39.3)	55 (39.6)	90 (39.5%)		
	Strongly disagree	18 (20.2)	20 (14.4)	38 (16.7%)		
∫Access to computer-based reporting systems	Strongly Agree	31 (34.8)	38 (27.7)	69 (30.5%)	Pearson chi-square	0.780
	Agree	40 (44.9)	66 (48.2)	106 (46.9%)		

Characteristics		**Doctors n=90 Number (%)**	**Nurses n=140 Number (%)**	**Total Number n=230 (%)**	**X^2 (value)**	***P-value*** **(df)**
from home, phone or hotline reporting	Neutral	7 (7.9)	14 (10.2)	21 (9.3%)	taken (1.758)	
	Disagree	7 (7.9)	10 (7.3)	17 (7.5%)		
	Strongly disagree	4 (4.5)	9 (6.6)	13 (5.8%)		
◊Education about the purpose of reporting Education about the purpose of reporting	Strongly Agree	31 (34.8)	54 (39.7)	85 (37.8%)	Fisher's exact taken (6.812)	0.111
	Agree	49 (55.1)	65 (47.8)	114 (50.7%)		
	Neutral	4 (4.5)	15 (11.0)	19 (8.4%)		
	Disagree	4 (4.5)	2 (1.5)	6 (2.7%)		
	Strongly disagree	1 (1.1)	0 (0.0%)	1 (0.4%)		
≠Clear guidelines about what adverse events and errors to report and who should report	Strongly Agree	35 (39.3)	55 (39.6)	90 (39.5%)	Fisher's exact taken (3.894)	0.276
	Agree	42 (47.2)	63 (45.3)	105 (46.0%)		
	Neutral	5 (5.6)	16 (11.5)	21 (9.2%)		
	Disagree	7 (7.9)	5 (3.6)	12 (5.3%)		
	Strongly disagree	0 (0.0)	0(0.0)	0 (0.0)		
♫Training on how information should be reported and what should be done with reports	Strongly Agree	35 (39.3)	68 (48.6)	10 3 (45.0%)	Fisher's exact taken (6.750)	0.077
	Agree	46 (51.7)	59 (42.1)	105 (45.9%)		
	Neutral	3 (3.4)	11 (7.9)	14 (6.1%)		
	Disagree	5 (5.6)	2 (1.4)	7 (3.1%)		
	Strongly disagree	0 (0.0)	0 (0.0)	0(0.0%)		
*Information on how confidentiality will be maintained if you supply your name	Strongly Agree	42 (47.2)	59 (42.8)	101 (44.5%)	Fisher's exact taken (2.051)	0.789
	Agree	37 (41.6)	63 (45.7)	100 (44.0%)		
	Neutral	5 (5.6)	9 (6.5)	14 (6.2%)		
	Disagree	4 (4.5%)	7 (5.1)	11 (5.0%)		
	Strongly disagree	1 (1.1)	0 (0.0)	1 (0.4%)		
•Incentives for time taken to report	Strongly Agree	22 (25.0)	30 (22.1)	52 (23.2%)	Pearson chi-square taken (7.955)	0.093
	Agree	22 (25.0)	53 (39.0)	75 (33.5%)		
	Neutral	20 (22.7)	29 (21.3)	49 (21.9%)		
	Disagree	17 (19.3)	12 (8.8)	29 (12.9%)		
	Strongly disagree	7 (8.0)	12 (8.8)	19 (8.5%)		

Note to table
A significance level of 0.05 was assigned
≠missing data (n=2, 0.9%)

*missing data (n=3, 1.3%)
ʃmissing data (n=4, 1.7%)
◊missing data (n=5, 2.2%)
♎missing data (n=1, 0.4%)
•missing data (n=6, 2.6%)

Item statement 35: Generalized feedback about reports received from the hospital reporting system

The majority of respondents (n=91/228, 39.9%) agreed that generalized feedback about reports received from the hospital reporting system can facilitate an error reporting culture, of whom nurses comprised a larger proportion (n=63/139, 45.3%) than doctors (n=28/89, 31.5%); the difference in responses between the groups was not statistically significant X^2(n=228) = 9.309, *P*=0.052.

Item statement 36: Individualized feedback to you about reports you submit

Data in Table 4-13 also showed that the majority of respondents (n=92/228, 40.4%) agreed that receiving individualized feedback about the reports submitted can facilitate error reporting culture, of whom nurses comprised a larger proportion (n=62/139, 44.6%) than doctors (n=30/89, 33.7); the difference in responses between the groups was not statistically significant X^2(n=228) = 9.229, *P*=0.050.

Item statement 37: Role models, e.g. senior colleagues, departmental directors who openly encourage reporting

The majority of respondents (n=105/227, 46.3%) agreed that senior colleagues, departmental directors who served as role models and encourage open reporting can facilitate reporting, of whom nurses comprised larger proportion (n=71/138, 51.4%) than doctors (n=34/89, 38.2%); the difference in responses between the groups was not statistically significant X^2(4, n=227) = 3.888, *P*=0.274.

Item statement 38: Legislated protection of information provided from use in litigation

The majority of respondents (n=88/226, 38.9%) agreed that legislated protection of information from use in litigation can facilitate an error reporting culture, of whom nurses comprised larger proportion (n=53/137, 46.0%) than doctors (n=25/89, 28.1%); the difference in responses between the groups was not statistically significant X^2(n=226) = 8.971, *P*=0.053.

Item statement 39: Anyone may report anonymously

The majority of respondents (n=93/225, 41.3%) agreed that anonymous reporting could facilitate reporting culture, of whom nurses comprised a larger proportion (n=58/136, 42.6%) than doctors (n=35/89, 39.3%); the difference in responses between the groups was not statistically significant X^2(n=225) = 2.011, *P*=0.756.

Item statement 40: The purpose and implementation of reporting systems should be addressed clearly

The majority of respondents (n=114/228, 50.0%) agreed that clearly addressing the purpose and implementation of reporting system can facilitate an error reporting culture, of whom nurses comprised a larger proportion (n=76/139, 54.7%) than doctors (n=38/89, 42.7%); the difference in responses between the groups was not statistically significant X^2(n=226) = 5.362, *P*=0.230.

Item statement 41: More blame attached to those who report errors

The majority of respondents (n=90/228, 39.5%) disagreed that attaching more blame to those who report error will facilitate reporting culture, of whom nurses comprised a large proportion (n=55/139, 39.6%) than doctors (n=35/89, 39.3%); the difference in responses between the groups was not statistically significant X^2(4, n=228) = 4.413, *P*=0.353.

Item statement 42: Access to computer-based reporting systems from home, phone or hotline reporting

The majority of respondents (n=106/226, 46.9%) agreed that access to computer based reporting systems from home, phone or hotline reporting can facilitate reporting, of whom nurses comprised a larger proportion (n=66/137, 48.2%) than doctors (n=40/89, 44.9%); the difference in responses between the groups was not statistically significant X^2(4, n=226) = 1.758, *P*=0.780.

Item statement 43: Education about the purpose of reporting

The majority of respondents (n=114/225, 50.7%) agreed that education about the purpose of reporting can facilitate reporting culture, of whom doctors comprised a larger proportion (n=49/89, 55.1%) than nurses (n=65/136, 47.8%); the difference in responses between the groups was not statistically significant X^2(n=225) = 6.812, *P*=0.111.

Item statement 44: Clear guidelines about what adverse events and errors to report and who should report

The majority of respondents (n=105/228, 46.0%) agreed that clear guidelines about what adverse events and errors to report and who should report them can facilitate error reporting, of whom nurses comprised a larger proportion (n=63/139, 45.3%) than doctors (n=42/89, 47.2%); the difference in responses between the groups was not statistically significant X^2(n=228) = 3.894, *P*=0.276.

Item statement 45: Training on how information should be reported and what should be done with reports

The majority of respondents (n=105/229, 45.9%) agreed that training on how information should be reported and what should be done with report can facilitate reporting culture, of whom of whom doctors comprised a larger proportion (n=46/89, 51.7%) than nurses (n=59/140, 42.1%); the difference in responses between the groups was not statistically significant X^2(n=229) = 6.750, *P*=0.077.

Item statement 46: Information on how confidentiality will be maintained if you supply your name

The majority of respondents (n=101/227, 44.5%) that providing information on how confidentiality will be maintained can facilitate reporting culture, of whom nurses comprised a larger proportion (n=59/138, 42.8%) than doctors (n=42/89, 47.2%) doctors; the difference in responses between the groups was not statistically significant X^2(n=227) = 2.051, *P*=0.789.

Item statement 47: Incentives for time taken to report

The majority of respondents (n=75/224, 33.5%) that providing incentive for time taken to report can facilitate an error reporting culture, of whom nurses comprised a larger proportion (n=53/136, 39.0%) than doctors (n=22/88, 25.0%); the difference in responses between the groups was not statistically significant X^2(4, n=224) = 7.955, *P*=0.093.

4.7 Summary

In this chapter the results from a 47-item survey questionnaire were presented.

The median age of the respondents was 36 years (range of 25-59). The typical nurse respondent was female having a diploma in nursing and no Master's degree or PhD, in contrast to the doctors, most of whom were male and a few had a postgraduate qualification. The gender difference between the two

groups was statistically significant (P<0.001). The majority of the respondents had 6-10 years of work experience and were in full-time employment and the difference in current work status (P=0.001) and years of work experience (P<0.001) between the two groups was statistically significant.

Awareness of error reporting system: most respondents disagreed that the hospital had a system in place for reporting errors but more nurses (56/140, 40.0%) than doctors (16/90, 17.8%) were aware of such a system and the difference in responses between the two groups achieved statistical significance (X^2(4, n=230) = 13.302, P<0.010); knew where and when to report errors (nurses 48.6%, n=68/140; doctors 20.0%, n=18/90) (X^2(n=230) = 23.843, P<0.001); how to locate an incident form (nurses n=60/139, 43.2%; doctors n=28/89, 31.5%) (X^2(4, n=228) = 9.842, P=0.043); and who to report an incident or error to (nurses n=72/140, 51.4%; doctors n=33/90, 36.7%) ($X^2$4, n=230) = 11.845, P=0.019). Results for type and frequency of errors reported and factors facilitating an error reporting culture did not achieve statistical significance.

Perceptions of barriers to error reporting: lack of confidentiality (nurses n=62/140, 44.3%; doctors n=27/87, 31.0%) (X^2(n=227) = 11.697, P=0.019). Most respondents were unsure if error reporting forms were easy to complete (nurses n=49/137, 35.8%; doctors n=26/88, 29.5%), (X^2(4, n=225) = 9.926, P=0.042). Factors not perceived as barriers: positive feedback when reporting errors (nurses n=61/140, 43.6%; doctors n=24/90, 26.7%), (X^2(n=230) = 10.939, P=0.026); reporting an error that did not cause harm (doctors n=40/90, 44.4%; nurses n=50/139, 36.0%), (X^2(4, n=229) = 9.618, P=0.047); time involved in reporting (nurses n=76/138, 55.1%; doctors n=26/89, 29.2%), (X^2(4, n=227) = 17.327); and learning from the error (doctors n=42/90, 46.7%; nurses n=40/138, 29.0%), (X^2(4, n=228) = 20.777, P<0.001).

4.8 Evaluation of the study

The STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guideline for reporting observational studies (EQUATOR Network) was used for reporting the study at its conclusion to standardize and enhance the quality and transparency of reporting. The need for improved reporting of scientific research in general led to influential statements of recommendations such as Strengthening Reporting of Observational studies in Epidemiology (STROBE) statement (Von Elm et al., 2007). The STROBE initiative was established in 2004 aiming at providing guidance on how to report observational research. Its guidelines provide a user-friendly checklist of 22 items to be reported in epidemiological

studies, with items specific to the three main study designs: cohort studies, case–control studies and cross-sectional studies (Gallo et al., 2012, p. 378). Therefore, the STROBE guideline in **Table 4-14** was used to report this observational study

Table 4-14: STROBE Guideline for reporting observational studies

Item	Item No	Recommendation	Application to study	Page
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	A descriptive cross-sectional design were reported to be utilized both in the abstract and in the research title.	Page vi-vii
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	Informative and balanced summary of what was done and what was found in the study was included in the abstract	Page vi-vii
Introduction				
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported **(page-)**	Patient safety implies freedom from accidental injury and elimination of patient injury caused by error (Garrouste-Orgeas et al., 2012, p. 2) or occurring as a result of unexpected adverse events of health care processes (Bahadori et al., 2013). Patient safety remains a priority issue for every health care system as it entails one of its main goals (Westat et al., 2010). Safety concerns, adverse events and near misses occurring within work situations if reported, provides room for improvement. Error reporting is therefore one type of safety information system that must be adopted to promote health and well-being of healthcare clients.	Page 2
Objectives	3	State specific objectives, including any pre-specified hypotheses **(page-)**	• identify and compare socio-demographic characteristics of doctors and nurses (age, gender, years of experience, educational level and current work status); • describe and compare doctors' and nurses' self-reported level of awareness and use of an error reporting system (Section B part of the questionnaire); • describe and compare the frequency of reporting various types of errors occurring in healthcare among doctors and nurses (Section C of the questionnaire); • describe and compare doctors' and nurses' perceptions of factors that serve as barriers to error reporting (Section D of the questionnaire); • describe and compare doctors' and nurses' perceptions of factors that facilitate an error reporting culture at the hospital (Section E of the questionnaire).	Page 7
Methods				
Study design	4	Present key elements of study design early in the paper	Cross-sectional design was stated as the design of the study in the abstract section; inter-reter reliability and content validity were presented under the general definitions.	Page vi-vii
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	This study was conducted at the Federal Teaching Hospital, Ido-Ekiti in Ekiti-State, Nigeria. The teaching hospital is one of the medium-sized government-owned health facilities situated in the south-western region of the country. The Federal Medical Centre Ido Ekiti came into being on 19 July, 1998 (FETHI, 2016) and was upgraded to a Teaching hospital status on 15 November, 2015 (FETHI, 2016). The hospital has more than 20	Page 47-48

Item	Item No	Recommendation	Application to study	Page
			departments and units with a bed capacity exceeding 400 within more than 22 wards and a staff of more than 500 doctors and nurses.	
Participants	6	(*aCross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	The population comprised medical doctors (residents, consultants and registrars) and nurses in various specialization fields who met the inclusion criteria and agreed to participate voluntarily after giving voluntary written informed consent as outlined in Appendix A. Respondents' suitability for inclusion in the study was ascertained before respondents were selected and thereafter randomized by simple random sampling technique. doctors and nurses directly involved in patient care in any clinical area/department of the hospital; doctors and nurses who had been practicing as registered professionals for not less than one year served were included in the study, while doctors and nurses in management positions and not providing direct patient care were excluded.	Page 48
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	Not applicable	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	Factors influencing error reporting	Title page & Page vi-vii
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	A 5-section survey questionnaire served as the study's research instrument (section 3.5.1). Thereafter the questionnaire validation processes were outlined and described for index of content validity (CVI) and face validity (section 3.5.2.1) by four experts and a pilot study (section 3.5.2.2) conducted on 30 respondents for test-retest reliability. The procedure for data collection, methods of data management and analysis were subsequently described.	Page 49-50
Bias	9	Describe any efforts to address potential sources of bias	Selection/sampling bias was avoided by the using the randbetween function in Microsoft excel to generate random sample of respondents. In addition, the researcher sampled all the eligible respondents so that doctors and nurses running the three shifts (morning, afternoon and night) were accessed and sampled. Response bias was prevented by using a combination of positively and negatively-worded questions in the different sections of the questionnaire.	Page 50 & 72
Study size	10	Explain how the study size was arrived at	The sample size was determined using Stat Calc (Epi info7, CDC). The sample size needed for this survey was calculated from a population of N=600 comprising 360 nurses and 240 doctors and based on the following information:	Page 65

Item	Item No	Recommendation	Application to study	Page
			Population of N=600; 95% confidence interval (CI); 5% confidence limit; margin of error; and an expected frequency of 50%. A sample size of n=234 emerged (comprising 94 doctors and 140 nurses).	
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	The returned questionnaires were numbered consecutively from 1 to 90 for doctors and 91 to 230 for nurses. The questions were coded and the raw data were captured directly onto a password protected IBM SPSS software spreadsheet (version 24, 2016) for coding, cleaning and analysis. Reverse coding was done for negatively worded items on the questionnaire where the Likert scale was used (Hutton, 2017). Reverse coding or scoring was done in a way that the numerical scoring on the questionnaire's Likert scale from strongly agree=1 to strongly disagree= 5 was run in the opposite direction (Hutton, 2017; Sauro, 2011). Questionnaire items recoded include: item statements 9, 10, 11, 20, 21, 27, 31, 32, 34 & 41. At the completion of the study data were copied onto a CD for safekeeping in a secure environment for 3 years.	Page 73
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding **(page-; table 3-5)**	Data were analyzed using descriptive and inferential statistics as outlined in Table 3-5. A significance level of 0.05 was assigned for all statistical analyses.	Page 73
		(*b*) Describe any methods used to examine subgroups and interactions	**Section A: Socio demographic characteristics** The age and years of work experience of the respondents (being an interval data) were analysed using frequency, Mean, min-max, SD. However, data were not normally distributed and the median and interquartile range were taken. Independent sample t-test was used to determine the differences in the age of doctors and nurses. The gender, profession, professional qualification and current work status were measured with Frequency/proportion, percentage, Chi-square/ Fisher's Exact test, df and P-value. For the Sections B, C, D and E, the median of the Likert scale was taken and differences in the responses of doctors and nurses was measured with Chi-square or Fisher's Exact test, df and P-value.	Page 74
		(*c*) Explain how missing data were addressed **(N/A)**	Missing values were dealt with by transforming and recoding; a value of -1 was used to replace the missing data.	Page 78
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed **(N/A)**	Not applicable	

Item	Item No	Recommendation	Application to study	Page
		Case-control study—If applicable, explain how matching of cases and controls was addressed **(N/A)** *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy **(page -)**		
		(*e*) Describe any sensitivity analyses		
Results				
Participants	13*	(a) Report numbers of individuals at each stage of study—e.g. numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analyzed	Respondents recruited for the study comprised of 230 health professionals (n=90 doctors, n=130 nurses). Two hundred and thirty (N=230) questionnaires were distributed to doctors and nurses at FETHI and all were returned (100%). For the validation of the questionnaire, four experts (n=2 doctors, 2 nurses) determined the index of content validity. Inter-rater reliability of the instrument was subsequently measured by test-retest reliability of data from a pilot study of 30 raters (n=13 doctors, n=17 nurses).	Page 78, 64 & 52
		(b) Give reasons for non-participation at each stage	Not Applicable	
		(c) Consider use of a flow diagram	Not Applicable	
Descriptive data	14*	(a) Give characteristics of study participants (e.g. demographic, clinical, social) and information on exposures and potential confounders	**Section A** with six (6) questions dealt with the socio-demographic characteristics of the respondents (gender, age, profession, education level, years of experience, and current working position in the institution) **Section B** covered the level of awareness and use of an error reporting system in the hospital. **Section C** focused on the practice of reporting various types of errors in healthcare. **Section D** was on perceptions of factors that may be barriers to error reporting. **Section E** consisted of 13 item statements with a focus on perceptions of factors that facilitate error reporting.	Page 51
		(b) Indicate number of participants with missing data for each variable of interest	**Section A** Age (n=8, 9.6%); Years of work experience (n=5, 2.2%); **Section B** I have never reported an incident or error I was involved in (item statement 9, n=1, 0.4%); I do not know how to locate an incident form (item statement 10, n=2, 0.9%); **Section C** Equipment fault resulting in patient harm (Q13, n=3, 1.3%); Infection acquired during hospital stay (Q16, n=1, 0.4%); Diagnostic errors that can cause serious disability or death (Q18, n=7, 3.0%); Haemolytic reaction due to the administration of ABO-incompatible blood or blood products (Q19, n=2, 0.9%);	79-80, 81, 85, 89 & 92-93

Item	Item No	Recommendation	Application to study	Page
			Section D I am not afraid of any adverse consequences of making a report such as litigation n=2, 1.3%); My colleagues will be unsupportive and cast blame on me (n=1, 0.4%); The response by supervisor/administrators does not match the severity of error (n=7, 3.0%); There is no point reporting an error that did not cause harm n=1, 0.4%); Making a report is not time consuming(n= 3, 1.3%); When I don't know whose responsibility it is to make a report (n= 3, 1.3%); When l do not consider an incident to be an error (n=4, 1.7%); The form is easy to fill in (n=5, 2.2%); The task l engage in at work makes me remember to report an error (n=5, 2.2%); There is no confidentiality of errors reported (n= 3, 1.3%); As long as the staff involved learn from incidents it is unnecessary to discuss them further (n=2, 1.3%). **Section E** Generalized feedback about reports received from the hospital reporting system (Q35, n=2, 0.9%) Individualized feedback to you about reports you submit (Q36, n=2, 0.9%) Role models, e.g. departmental directors who openly encourage reporting (Q37, n=3, 1.3%) Legislated protection of information provided from use in litigation (Q38, (n=3, 1.3%) Anyone may report anonymously (Q39, n=5, 2.2%) The purpose and implementation of reporting systems should be addressed clearly (Q40, n=2, 0.9%) More blame attached to those who report errors (Q41, n=2, 0.9%) Access to computer-based reporting systems from home, phones or hotline reporting (Q42, n=3, 1.3%) Education about the purpose of reporting (Q43, n=5, 2.2%) Clear guidelines about what adverse events and errors to report and who should report (Q44, n=2, 0.9%) Training on how information should be reported and what should be done with reports (Q45, n=1, 0.4%) Information on how confidentiality will be maintained if you supply your name (Q46, n=3, 1.3%) Incentives for time taken to report (Q47, n=6, 2.6%).	
		(c) *Cohort study*—Summaries follow-up time (e.g., average and total amount)	Not applicable	

Item	Item No	Recommendation	Application to study	Page
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	Not applicable	
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	Not applicable	
		Cross-sectional study—Report numbers of outcome events or summary measures	The level of awareness and use of an error reporting system in the hospital; the frequency of reporting various types of errors in the hospital; perceived barriers to error reporting; and a perceived factors that facilitate an error reporting culture.	Page 82-102
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	The median age of the respondents was 36 years (range of 25-59). The typical nurse respondent was female having a diploma in nursing and no Master's degree or PhD, in contrast to the doctors, most of whom were male and a few had a postgraduate qualification. The gender difference between the two groups was statistically significant (P<0.001). The majority of the respondents had 6-10 years of work experience and were in full-time employment and the difference in current work status (P=0.001) and years of work experience (P<0.001) between the two groups was statistically significant. Awareness of error reporting system: most respondents disagreed that the hospital had a system in place for reporting errors but more nurses (56/140, 40.0%) than doctors (16/90, 17.8%) were aware of such a system and the difference in responses between the two groups achieved statistical significance (X^2 (4, n=230) = 13.302, P<0.010); knew where and when to report errors (nurses 48.6%, n=68/140; doctors 20.0%, n=18/90) (X^2 (n=230) = 23.843, P<0.001); how to locate an incident form (nurses n=60/139, 43.2%; doctors n=28/89, 31.5%) (X^2 (4, n=228) = 9.842, P=0.043); and who to report an incident or error to (nurses n=72/140, 51.4%; doctors n=33/90, 36.7%) (X^2 (4, n=230) = 11.845, P=0.019). Results for type and frequency of errors reported and factors facilitating an error reporting culture did not achieve statistical significance. Perceptions of barriers to error reporting: lack of confidentiality (nurses n=62/140, 44.3%; doctors n=27/87, 31.0%) (X^2 (n=227) = 11.697, P=0.019). Most respondents were unsure if error reporting forms were easy to complete (nurses n=49/137, 35.8%; doctors n=26/88, 29.5%), (X^2 (4, n=225) = 9.926, P=0.042). Factors not perceived as barriers: positive feedback when reporting errors (nurses n=61/140, 43.6%; doctors n=24/90, 26.7%), (X^2 (n=230) = 10.939, P=0.026); reporting an error that did not cause harm (doctors n=40/90, 44.4%; nurses n=50/139, 36.0%), (X^2 (4, n=229) = 9.618, P=0.047); time involved in reporting (nurses n=76/138, 55.1%; doctors n=26/89, 29.2%), (X^2 (4, n=227) = 17.327); and learning from the error (doctors n=42/90, 46.7%; nurses n=40/138, 29.0%), (X^2 (4, n=228) = 20.777, P<0.001)	Page 102-105

Item	Item No	Recommendation	Application to study	Page
			The median age of the respondents was 36 years (range of 25-59). The typical nurse respondent was female having a diploma in nursing and no Master's degree or PhD, in contrast to the doctors, most of whom were male and a few had a postgraduate qualification. The gender difference between the two groups was statistically significant (P<0.001). The majority of the respondents had 6-10 years of work experience and were in full-time employment and the difference in current work status (P=0.001) and years of work experience (P<0.001) between the two groups was statistically significant. Awareness of error reporting system: most respondents disagreed that the hospital had a system in place for reporting errors but more nurses (56/140, 40.0%) than doctors (16/90, 17.8%) were aware of such a system and the difference in responses between the two groups achieved statistical significance (X^2 (4, n=230) = 13.302, P<0.010); knew where and when to report errors (nurses 48.6%, n=68/140; doctors 20.0%, n=18/90) (X^2 (n=230) = 23.843, P<0.001); how to locate an incident form (nurses n=60/139, 43.2%; doctors n=28/89, 31.5%) (X^2 (4, n=228) = 9.842, P=0.043); and who to report an incident or error to (nurses n=72/140, 51.4%; doctors n=33/90, 36.7%) (X^2 (4, n=230) = 11.845, P=0.019). Results for type and frequency of errors reported and factors facilitating an error reporting culture did not achieve statistical significance. Perceptions of barriers to error reporting: lack of confidentiality (nurses n=62/140, 44.3%; doctors n=27/87, 31.0%) (X^2 (n=227) = 11.697, P=0.019). Most respondents were unsure if error reporting forms were easy to complete (nurses n=49/137, 35.8%; doctors n=26/88, 29.5%), (X^2 (4, n=225) = 9.926, P=0.042). Factors not perceived as barriers: positive feedback when reporting errors (nurses n=61/140, 43.6%; doctors n=24/90, 26.7%), (X^2 (n=230) = 10.939, P=0.026); reporting an error that did not cause harm (doctors n=40/90, 44.4%; nurses n=50/139, 36.0%), (X^2 (4, n=229) = 9.618, P=0.047); time involved in reporting (nurses n=76/138, 55.1%; doctors n=26/89, 29.2%), (X^2 (4, n=227) = 17.327); and learning from the error (doctors n=42/90, 46.7%; nurses n=40/138, 29.0%), (X^2 (4, n=228) = 20.777, P<0.001)	
		(b) Report category boundaries when continuous variables were categorized (*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Not applicable	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	Not applicable	

Item	Item No	Recommendation	Application to study	Page
Discussion				
Key results	18	Summarise key results with reference to study objectives	Doctors and nurses were mostly unaware of the hospital's error reporting system which can be concluded to be an organizational factor. Respondents would be willing to report incidents if perceived barriers are removed. There is an urgent need for an effective error reporting system to be implemented in the local setting and for appropriate awareness training and educational interventions to improve doctors' and nurses' knowledge and use of medical error reporting.	Page vi-vii
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	In addition, the results are based on self-reported perceptions of factors influencing error reporting and not actual reporting of errors. The use of a document to gather self-reported data though self-administration of questionnaire could increase social desirability response bias associated with self-reported instruments (Polit & Beck, 2012). Participants could misrepresent their opinions in the direction of answers consistent with prevailing social norms (Polit & Beck, 2012). This could have a resultant effect on the validity and accuracy of the results. However, observational methods may yield better data than self-report when people are unaware of their own behaviour.	Page 122-123
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	In this study, the majority of the respondents reported that there is lack of reporting system in the hospital which was further corroborated by many of the respondents acknowledging that error reporting system was not effective in the hospital. This factor could be responsible for the low reporting practice of various forms of errors. Based on the study findings, there is possibility that a system is not in existence or not in use. This obvious case of absence or underuse poses resultant danger to the quality and safety of hospital clients and patients. But this could be avoided if clinicians have access to an effective system that fits the need of the users, the work environment and the work flow (task). Reporters will be motivated to disclose error when the system is easy to use, there is an observable outcome, provides feedback, user friendly (i.e. non-punitive) and reporters believe in the system.	Page 121
Generalisability	21	Discuss the generalisability (external validity) of the study results	The research setting for the study was conducted in only one tertiary health institution in South-west Nigeria and did not include regional hospitals. The use of a single research site in one Nigerian city may make findings difficult to be generalized to other settings where factors influencing error reporting differ. Involving multiple hospitals could have given a truer picture of factors influencing error reporting in Nigerian hospitals. However, it cannot be assumed that the same respondents and response patterns will give the same result in other populations. Therefore, the results of this study should be interpreted with caution.	Page 123
Other information				

Item	Item No	Recommendation	Application to study	Page
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	This study was conducted by a Master's student of the University of Cape Town under the supervision of a PhD-prepared faculty member. The study is based on the research supported in part by the National Research Foundation of South Africa for the Grant Reference: SFH160615171759, UID: 107108.	Page 136

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

CHAPTER FIVE
DISCUSSION, IMPLICATIONS, RECOMMENDATIONS AND CONCLUSION

5.1 Introduction

A review of available published literature and validated studies has shown that, to avert serious consequences of errors, health professionals should be able to identify and report adverse events that have occurred during a patient's care. Communication of healthcare errors is necessary for patient safety and improved healthcare outcomes. Also, disclosure of medical errors plays a major role in dictating the overall efficiency of hospitals and medical the community as a whole. Error reporting systems (ERSs), established and utilized since 1999 were designed to enhance patient safety event reporting and foster effective communication of errors between professionals and hospital management. Importantly, the decision and responsibility to report errors lies in the hands of doctors and nurses who are saddled with the responsibility of providing care to patients.

However, the published literature on incident or error reporting is primarily from the developed countries. No study appears to have been carried out in Nigeria on doctors and nurses' self-reported perceptions of factors influencing the reporting of errors, the practice of error reporting and level of awareness and use of error reporting systems.

The aim of the study was to describe doctors' and nurses' self-reported perceptions of factors that are barriers or facilitators of error reporting in the federal teaching hospital, Ido-Ekiti in Nigeria. This was achieved. The respondents included practicing doctors and nurses in various fields of specialization. Holden and Karsh Health Information Technology model with an emphasis on ERS was used to conceptualize the study and interpret the findings. The study aim was accomplished through the identified objectives. The key findings are summarized for each stated objective. In this chapter the results presented in Chapter Four are discussed, the recommendations and implications thereof for nursing practice, policy making, research and education are addressed and recommendations are made.

5.2 Principal findings

5.2.1 Respondents' socio-demographic characteristics

The majority of respondents (n=116/208, 50.4%) (Table 4-1) were within the age range of 31-40 years (median 36). The distribution of the data for age was slightly skewed to the right of the bell curve, indicating an older population of doctors and nurses in the hospital but the difference between doctors and nurses was not statistically significant (*P=0.308)*. The age distribution of respondents in this study aligned with data published in 2008 in the Nigerian Professional Regulatory Source (NPRF) that indicated that the age of the majority of health professionals was below 50 years and only a minority were below 30 years of age (Labiran, Mafe, Onajole, & Lambo, 2008).

The majority of respondents (Table 4-3) were nurses (n=140/230, 60.9%) and female (n=115/140, 50.0%) (Table 4-4) even within the group, whereas for the doctors (n=90), the majority were male (n=59/90, 25.7%) and the gender difference was significant (*P*<0.001). The gender disequilibrium observed among nurses and doctors in this study may be attributed to the fact that nursing is mostly female dominated and the medical profession is mostly male dominated. Findings reflect the situation in Nigeria as reported by Labiran et al. (2008) that 20% of 52,408 Nigerian physicians compared to 94.6% of 90,489 Nigerian nurses were female. A similar finding was reported more recently by Alboliteeh and Almughim (2017) who observed that the nursing profession is dominated by females in most medical institutions and primary health centers in Saudi Arabia.

The majority of nurses (n=92/230, 40.0) (Table 4-3) reported having a diploma in nursing and limited their choice to one qualification with no respondent reporting having a Masters or PhD degree. In Nigeria doctors are degree-prepared so it was not unexpected to find that the majority reported having a MBBS/MD/MOD as their professional qualification and a few reported having a Masters or PhD degree. The difference between doctors and nurses' professional qualifications (Table 4-4) achieved statistical significance *(P<0.001).* This finding is a true reflection of what was reported in Nigeria, that nursing education is primarily at diploma level and hospital-based producing nursing qualifications as a Registered Nurse (RN) or Registered Midwife (RM), making upward academic progression an uphill task for nurses (Ayandiran, Irinoye, Olayiwola Faronbi, & Mtshali, 2013). This high number of hospital-based diplomates in Nigeria was reportedly a challenge attributed to the failure of alignment of nursing education to national and international educational reforms which had been achieved by other health professions many years ago.

The majority of respondents (n=94/225, 40.9%) had 6-10 years of work experience (Table 4-3). The proportion is higher than what was reported in Saudi Arabia, where most of the respondents had three to five years of work experience (Alboliteeh & Almughim, 2017). The minimum to maximum years of work

experience reported for doctors was between 1-28 years and for nurses 2-32 years, denoting a higher number of years of work experience for nurses than doctors and the difference achieved statistical significance*(P=0.002)* (Table 4-5).

In this study, the majority of nurses (n=139/230, 60.4%) were in full-time employment (Table 4-4) compared to doctors (n=81/230, 35.2%) and within their groups. The difference in work status between doctors and nurses achieved statistical significance (*P*=0.001). Handler et al. (2007b) reported that the majority of respondents (physicians, nurses, pharmacists and advanced practitioners) in their study were full-time employees (n=83/104, 79.8%).

5.2.2 Respondents' self-reported level of awareness and use of an error reporting system

Despite the majority of respondents reporting not being aware of a hospital error/incident reporting system, they knew where and when to report, how to locate an incident form, and who to report an incidence or error to but had not reported an incident or error (Table 4-7). Doctors were significantly more likely than nurses to disagree that the hospital had a system for reporting errors (44.4% doctors versus 35.0% nurses; *Pearson chi-square P= 0.010).* A study undertaken in Nigeria by Ogundiran and Adebamowo (2012) reported that a documented policy statement about information disclosure was not available in most hospitals and Todar et al. (2017) reported on a study undertaken in India that only (n=40/100, 40%) respondents were knowledgeable of the existence of reporting systems in the hospitals. Results of the present study contradict the findings of Evans et al. (2006) who reported that most doctors and nurses (760/773, 98.3%) were aware that their hospital in South Australia had an incident reporting system.

Nurses were significantly more likely than doctors to know where and when to report errors (68/140, 48.6% nurses versus 18/90, 20.0% doctors); *P*<0.001. This result is consistent with the findings of another study conducted in the United States where non-physicians comprising nurses were significantly more knowledgeable of how to report an error compared to physicians *(P= 0.028)* (Smith et al., 2014).

Nurses were more likely than doctors to know how to locate an incident form and the difference reached statistical significance (*P= 0.043).* Evans et al. (2006) reported that there was a greater likelihood of nurses (515/587, 88.3%) in South Australia knowing how to access a report than doctors (77/186, 43.0%), (*P< 0.010).*

Findings also revealed that the majority of the respondents had good knowledge of who to report an incident or error to but nurses 99/140 (70.7%) were more knowledgeable than doctors; 44/90 (48.9%) doctors, and the difference reached statistical significance (*P=0.019*). A study undertaken in Saudi Arabia reports that

the majority of the respondents did not report errors because they did not know to which medical staff/hospital authority to report (Abdel-Latif, 2016).

The majority of respondents (n=114/230, 49.8%) had never reported an incident/error they were involved in and the difference in the responses of doctors and nurses was not statistically significant. Carandang et al. (2015) reported that health practitioners had an unfavourable attitude towards medication error reporting.

5.2.3 Respondents' frequency of reporting various types of errors

Grouping the two extremes of the scale (Never and always), most of the types of errors listed in Section C of the questionnaire that had serious or fatal consequences for patients had never been reported: wrong drugs, faulty equipment, serious errors, diagnostic errors and haemolytic reactions due to the administration of ABO-incompatible blood or blood products. The findings showed that few respondents occasionally reported communication errors (n=93/230, 40.4%), hospital acquired infection (n=122/229, 53.3%) and pressure sores acquired during hospital care (n=114/230, 49.6%). This findings revealed that the majority of respondents have poor error reporting practice and there was no statistically significant difference between respondents' profession and reporting practice except for 'serious errors like delay in patients' treatment resulting in death' *(P=0.010).*

The results of the present study corroborates the findings of Evans et al. (2006) who reported that drug error in South Australia was the least perceived to be reported by their respondents (n=246/587, 41.9% nurses and (n=78/186, 72.8%). However, this findings is not in accordance with the findings of another study conducted in Netherland where it was observed that self-reported incidents by medical staff were mostly those related to medication errors (Brunsveld-Reinders et al., 2016). In addition, the findings contradict the result of a study by Evans et al. (2006) who observed that nurses and doctors in South Australia most often completed incident reports for patient falls and least often for pressure sores.

Therefore, the poor reporting practice of doctors and nurses in this study appeared to be consistent with those described in a study by Kaldjian et al. (2008) undertaken in the United State who reported that even though reporting errors improves the quality of care for future patients, only (n=60/338, 17.8%) respondents had reported an actual minor error (resulting in prolonged treatment or discomfort), and only (n=13/338, 3.8%) had reported an actual major error (resulting in disability or death). Similarly, the findings were also consistent with those of Hajibabaee et al. (2014) who reported that more errors were committed by health professionals than reported.

5.2.4 Objective 3: Respondents' perceived reporting barriers

Findings of the study showed that majority of the respondents perceived eight of 15 items as barriers to reporting. The respondents' perceptions of barriers to reporting incidents/errors included: colleagues being unsupportive and casting blame (n=102/229, 44.5%), (Q22), errors being regarded not as an organizational/system error but rather the individual's error (n=183/230, 79.6%), (Q23), patients losing trust in them and feeling unsafe in their presence (n=129/230, 56.1%), (Q24), supervisors/administrators' responses not matching the severity of the error (n=131/223, 58.7%), (Q25), not considering an incident to be an error (n=98/226, 43.4%) (Q29), an ineffective hospital error reporting system (n=125/230, 54.3%), (Q30), error reporting forms that are not easy to fill in (n=88/225, 39.1%) (*P*=0.042), (Q31) and no confidentiality of errors reported (n=138/227, 60.8%), (0.019) (Q33).

Surprisingly, the majority of respondents reported that there is positive feedback when errors are reported (Q20) so it is difficult to interpret how this response is perceived as a barrier to reporting incidents/errors unless the opposite is true, that negative feedback would be a barrier. The difference in response between nurses and doctors was statistically significant (*P*=0.026). Also, most respondents reported not being afraid of any adverse consequences such as litigation if they reported an error/incident (Q21) it is interpreted that fear could be a barrier to reporting. Likewise, most respondents reported that errors should be reported even if these did not cause harm (Q26) and the difference between nurses and doctors was statistically significant *P*=0.047. Most respondents reported that error reporting is not time consuming (Q27), that can be interpreted as a barrier to reporting if it is and the difference between nurses and doctors was statistically significant (*P*=0.002). Most of the respondents disagreed and do not perceive "not knowing whose responsibility it is to report an incident/error' a reporting barrier (Q28). Most of the respondents agreed that the task they engage in at work makes them remember to report an error; nature of task can be interpreted as a barrier to error reporting if it is (Q32).There was a perception that if the staff involved in an incident had learnt from the event and no further action was taken (Q34) it could be a barrier to error reporting; and the difference between nurses and doctors was statistically significant

Each of the barriers identified by respondents in this study have been identified in previously published literatures Covell and Ritchie (2009); (Todar et al., 2017). This findings revealed that despite information about reporting barriers being available, these barriers still exists (Hartnell et al., 2012). This finding is in agreement with other published literatures on reporting barriers. According to the result of present study, over half (n=138/227, 60.8%) of the respondents perceived lack of confidentiality of errors reported as a barrier to reporting. This findings is consistent with what was reported in another study, where it was reported that health professionals were more comfortable and willing to report medical errors when the system for reporting is anonymous and confidentiality is guaranteed (Holden & Karsh, 2007; Perez et al.,

2014). This factor explains why (n=272/308, 88.9%) of errors were unofficially and orally reported in a Taiwan study, where respondents had the fear of leaving any incriminating evidence which could be used against them (Yung et al., 2016b). The findings of Yung and his colleagues is evident in this present study where it was observed that majority of the respondents had low rates of reporting various types of hospital errors (section C; Item Statements 12-19) through the hospital's reporting system. Therefore reporting might be associated with informal report or discussion of errors with colleague, rather than appropriate filing through the reporting system.

Findings of this study also revealed that errors are being regarded not as an organizational/system error but rather the individual's error. The result corroborates the findings of other studies where it was observed and reported that key stakeholders in hospitals are important factors affecting how professionals felt about revealing errors (Bahadori et al., 2013; Covell & Ritchie, 2009).

Similarly, the present study identified the response by the supervisor as a mismatch of error severity. Bahadori et al. (2013) in a similar study conducted among nurses in Iran found that managerial variables such as the heads focusing only on finding the culprits and blaming them, regardless of other factors involved in the occurrence of errors as an important reporting barrier. Similarly, Soydemir et al. (2016) in a study conducted in Turkey associated reporting barriers to fear (of disapproval or being blamed by colleague), attitude of the administration (lack of support from the administrators), lack of reporting system, difficulty in usage, lack of knowledge about the use of the system), employees perception (lack of knowledge about medical errors, considering errors normal, not considering it as an error, seriousness of an error).

Another reporting barrier identified by the respondents is ineffectiveness of the hospital's ERS. A Canadian study have similarly found that reporting system is ineffective because nothing happens after reports, a lack of trust about how error reports might be used, and an assumption that reporting an error is someone else's responsibility are important barriers (Hartnell et al., 2012).

5.2.5 Objective 4: Respondents' perceived factors that facilitate an error reporting culture

This study provides a large scale account of perceived factors that facilitate an error reporting culture as reported from the doctors and nurses viewpoints. The majority of respondents' perceptions of factors that facilitate reporting incidents/errors included: generalized feedback about reports received from the hospital reporting system (n=157/228, 68.9%, *P*=0.052),(Q35), individualized feedback about reports submitted (n=152/228, 66.7%, *P*=0.05), (Q36), role models who openly encourage reporting (n=180/227, 79.3%), (Q37), legislated protection of information provided from use in litigation (n=154/226, 68.1%, *P*=0.053) (Q38), anonymous reporting (n=150/225, 66.7%), (Q39), clear guidelines about the purpose and

implementation of reporting systems (n=203/228, 89.0%), (Q40), access to computer-based reporting systems from home phone or hotline reporting (n=175/226 (77.4%), (Q42), education about the purpose of reporting (n=199/225, 88.4%), (Q43), clear guidelines about the type of adverse events and errors to report and who should report (n=195/228, 85.5%), (Q44) training on how information should be reported and what should be done with reports (n=208/229, 90.8%), (Q45), information on how confidentiality will be maintained if names are provided (n=201/228, 88.5%), (Q46), and incentives for time taken to report (n=127/228, 56.7%), (Q47). Attaching more blame to those who report errors was not perceived to facilitate error reporting (n=128/228, 56.1%), (Q41).

This finding is consistent with results from previous studies that have focused on facilitators of error reporting (Elder et al., 2007; Handler et al., 2007b; Hartnell et al., 2012; Heard et al., 2012; Jewell & McGiffert, 2009). In this study, majority of the respondents believed that addressing systems or organizational factors or administrative factors relating to reporting will facilitate a reporting culture. This result is consistent with the findings of (Hartnell et al., 2012); Similarly, Jewell and McGiffert (2009) recommended that reporting should be focused on improving the hospital system or organization rather than blaming individuals that have committed errors. Heard (2007) also reported that providing generalized deidentified feedback about adverse event and error reports, role models such as senior colleagues who openly encourage reporting, and legislated protection of reports from legal discoverability are perceived strategies that aid reporting. Hartnell et al. (2012) opined that bridging the communication gap, providing incentives and educating for success are simple changes that could bring improved reporting culture.

5.3 Interpretation of the study findings according to the theoretical model of health information technology usage behavior

Holden and Karsh's (2009) theoretical model of health information technology (HIT) usage behavior has implications for patient safety. The clinician – HIT system and its characteristics (for example, HIT ease of use/usability, capabilities, flexibility, and clinician skills, attitudes, needs) interact directly with the context where it is applied (for example the work group or unit), as well as indirectly with levels higher-up (for example, the overall health care organization). These between-levels interactions and the interactions between work system characteristics within levels determine fit, a central concept of the model. The model focuses not only on the design and implementation of an error reporting system but also on the clinical work environment. This was reported to greatly influence how and whether clinicians will accept or reject a HIT.

Based on the findings of this study and the Holden and Karsh HIT model (2009), a system design might improve the reporting culture and therefore patient safety at the research hospital. It would be necessary to

provide clear guidelines on who is responsible for reports, what should be reported and how reports should be processed to improve the level of awareness about the hospital's reporting system. The poor reporting practice identified in the study can be attributed to a number of barriers identified. It is therefore imperative that a reporting system that is usable (easy to use and time efficient) should be considered for introduction in the hospital (Holden, 2007). In addition, feedback should be provided to staff who report errors, and they should be rewarded and punishment eliminated to foster an error reporting culture in the hospital.

In this study, uncertainty about the existence of an error reporting system in the hospital indicates a weakness in the reporting system which was further corroborated by many of the respondents acknowledging that the current error reporting system was not effective. This factor could be responsible for the low reporting practice of various types of errors. The absence or underuse of a reporting system poses a threat to the quality and safety of hospital clients and patients. But this could be avoided if clinicians have access to an effective system that fits the needs of the users, the work environment and the work flow (tasks). Staff who report errors will be motivated to disclose errors when the system is easy to use, has observable outcomes, provides feedback, is user friendly (non-punitive) and reporters believe in the system.

5.4 Strengths and limitations of the study

5.4.1 Strengths

There is a paucity of published literature from Nigeria on medical error reporting in general and specifically on reporting of various types of healthcare errors, the practice of error reporting and factors that influence error reporting. This study appears to be the first to describe the factors that are perceived to be barriers and those that facilitate error reporting among doctors and nurses. The role of doctors and nurses in limiting adverse events in health care systems cannot be underestimated and to achieve this, knowledge of the factors that improve or impede error reporting is important. The present study has provided this data from a 47-item survey questionnaire.

The impact of recall bias was low as all of the respondents completed and returned the questionnaire. Whereas a 50% response rate is reportedly acceptable for a survey (Grove et al., 2014; Polit & Beck, 2012), the present study achieved a 100% response rate. The good response rate may have been due to the fact that the questionnaires were personally distributed in a particular setting (FETHI).

Respondents used for the CVI to validate the prototype questionnaire, possessed a wealth of experience in various fields of medical and nursing specializations and worked in different hospitals across Nigeria and South Africa. In addition, a large number of doctors and nurses (230 respondents) were surveyed in the hospital using a simple random sampling technique that helped to ensure each member of the population

had an equal opportunity of being included and this reduced selection bias (Polit & Beck, 2012). The modification of the questionnaire, adapted from publicly available published literature on error reporting, gave an opportunity for negatively-worded item statements to be included. Validation of survey questionnaires is not often published and, in addition to the CVI, IRR testing was subsequently also determined.

5.4.2 Limitations

Limitations of study methods

Statement item 4 of the questionnaire required respondents to fill in the required information in the blank spaces and to tick other boxes as appropriate but no respondents listed more than one qualification so it is not known if respondents had more than one qualification. The wording of the item could have been improved by asking the respondent to select more than one option that is, an undergraduate and/or a postgraduate qualification.

The research setting for the study was conducted in only one tertiary health institution in South-west Nigeria and did not include regional hospitals. The use of a single research site in one Nigerian city may make findings difficult to be generalized to other settings where factors influencing error reporting differ. Involving multiple hospitals could have given a truer picture of factors influencing error reporting in Nigerian hospitals. However, it cannot be assumed that the same respondents and response patterns will give the same result in other populations. Therefore, the results of this study should be interpreted with caution.

Health professionals in managerial positions were exempted from the study because they were not directly involved in patient care processes; their work usually involves dealing with administrative aspects of error reporting. This factor may limit the generalizability of the results and other studies report that managerial support is needed to foster reporting practice (Heard, 2007; Elder, 2007).

In addition, the results are based on self-reported perceptions of factors influencing error reporting and not actual reporting of errors. The use of a document to gather self-reported data though self-administration of questionnaire could increase social desirability response bias associated with self-reported instruments (Polit & Beck, 2012). Participants could misrepresent their opinions in the direction of answers consistent with prevailing social norms (Polit & Beck, 2012). This could have a resultant effect on the validity and accuracy of the results. However, observational methods may yield better data than self-report when people are unaware of their own behaviour. Social context bias can be prevented when generalizing findings or evidence from tightly controlled research settings to real-world clinical practice settings (Polit & Beck,

2012). The present study was a real-world clinical practice setting that should have limited social context bias.

5.5 Wider Implications

5.5.1 Meaning of the study: Possible implications for clinicians or policymakers

The identification of factors influencing error reporting is a strategy aimed at working together to reduce the occurrence and degree of medical errors in order to promote safe and improved healthcare quality. Respondents who reported a neutral view (does not support or oppose) of the complexity of error reporting forms as a perceived barrier factor preventing error reporting in the hospital might, in all likelihood, never have used such a form. Respondents' uncertainty may also be attributed to their perceptions regarding the ineffectiveness of the hospital's error reporting system (Garbutt et al., 2008) as the majority of the respondents had earlier reported that their hospital's error reporting system was not effective (Holden & Karsh, 2007). As such, respondents' uncertainty may be responsible for the inconsistency in their response to two other items in perceived reporting barriers ('making a report is not time consuming' and 'the task l engage in at work makes me remember to report an error'). Therefore, this perceived ineffectiveness of the hospital's error reporting system calls for a system re-design needed to influence the submission of error reports (Wolf & Hughes, 2008b). There should be a move away from naming, blaming and shaming those who report errors to a culture of learning from errors and thereby encouraging error reporting (Bahadori et al., 2013; Elder et al., 2007).

An important factor identified from the literature review was the paucity of literature involving reporting of various types of medical errors. Most of the identified literature focused on medication or drug errors or adverse drug reactions; while only a few studies addressed diagnostic, blood transfusion, communication, hospital-acquired infection, equipment errors and others that were addressed in the present study. These medical errors are common to all healthcare settings: community settings, nursing homes, free-standing short-procedure units, and primary care offices. Evidence-based policies to guide error reporting in all clinical areas should be formulated.

5.5.2 Unanswered questions and future research

Most of the research on error reporting cited in this study has been conducted over the past 10 years. The studies reviewed for the present study provide important insight into what is being reported and were primarily descriptive and qualitative; none were nonrandomized or randomized controlled trials. Thus, additional well-designed studies are called for (Wolf & Hughes, 2008b, p. 355). Essentially, Nigeria is yet to put in place a system for detecting and reporting errors. Ayodele (2011); Ogundiran and Adebamowo

(2012) reported that provision of hospital information systems including strategic decision support systems and clinical support systems such as documentation, Laboratory Information Systems (LIS) among others can improve quality of care and patient safety.

Further research is needed to provide evidence that intervention studies incorporating medical errors, causes of under-reporting and strategies to reduce error occurrence would aid improved patient care outcomes. In addition, clarification on whether or how health professionals use a decision-making process when responding to medical error is also required (Covell & Ritchie, 2009).

5.5.3 Recommendations

The following recommendations are proposed to improve patient safety and enhance overall health outcomes.

5.5.3.1 Recommendations for education based on the findings of the study

- Undergraduate medical and nursing curricula should include error reporting with specific learning outcomes pertaining to training on the practice of error reporting, types of reportable errors, consequences of medical errors and the effect it has on patient's healthcare outcomes and on the health system. It is therefore recommended by the World Health Organization (2014) that the guidelines on patient safety be incorporated into nursing and medical curricula. A Multi-professional Patient Safety Curriculum Guide for patient safety education has been published. This comprehensive guide assists universities and schools in the fields of dentistry, medicine, midwifery, nursing and pharmacy to teach patient safety. It also supports the training of all health-care professionals on important patient safety concepts and practices (World Health Organization, 2014).
- Ongoing and continuing education even in clinical practice on management of medical errors is essential to improve healthcare quality and outcomes. With advancement in technology and new trends in treatment of diseases, increasing complexity of health needs and methods of care in health systems, it is essential and recommended that health professionals undergo in-service training that will promote continuing learning and participation in research relating to medical error reporting and error prone processes in healthcare (Hung et al., 2016).
- It is crucial that effective communication and collaborative skills be instituted into student training programs and at all levels of training preparation as this is essential to convey information and instructions within and among health teams; and has been shown to reduce the incidence of communication errors (Abdel-Latif, 2016).

5.5.3.2 Recommendations for clinical practice

Holden and Karsh (2007, p. 273) indicated that successful medical error reporting systems is one approach toward safer and higher quality patient care and that a successful system depends on how well the system achieves its goals. Based on the findings of the present study, the following strategies are recommended to improve the practice of medical error reporting in health care institutions following Holden and Karsh' framework:

- Development of a simple and easy to use error reporting system that will fit the complexities of healthcare systems (i.e. the work system and its tasks).
- Provision of training or education on use of the system designed.
- Enforcement of plans and educational initiatives is needed by hospital policy makers or administrators to raise awareness by health professionals of resources available to reporting healthcare errors.
- Hotline reporting should be implemented and there should be provision of timely and appropriate feedback to staff after making reports.
- Periodic evaluation of reports to identify improvements or any shortcomings is also essential to motivate learning from errors.
- A non-punitive environment that encourages reporting should be provided with appropriate response and healthcare professionals who report errors should be protected from litigation or any disciplinary actions.

5.5.3.3 Recommendations for research

- It is evident that factors influencing healthcare errors have not been extensively studied in Nigeria. Also, the country is yet to establish a reporting system at national level. It is recommended that a system for tracking errors both at institutional and national levels be put in place and research conducted to address salient issues relating to involvement of health personnel in clinical research.
- Knowledge of cross-professional and cross-cultural differences pertaining to medical error reporting among professionals in healthcare would broaden the understanding of the reporting barriers and appropriate measures to be instituted.
- Improved methods to access error reporting systems should be investigated to foster a reporting culture: computer-based reporting systems from home and telephones or hotline reporting.
- To encourage reporting legislated protection of information that is reported should be investigated.

- There should be investigation into the allocation of resources needed to encourage a reporting culture to ensure improved patient care and outcomes.
- The study has resulted in hypothesis generation:
  Null hypothesis (H_0): Clear guidelines for a hospital error reporting system will not result in an error reporting culture.
  Alternate hypothesis (H_a): Clear guidelines for a hospital error reporting system will result in an error reporting culture.

5.6 Conclusion

The present study revealed that despite the majority of respondents reporting not being aware of a hospital error/incident reporting system, they knew where and when to report, how to locate an incident form, and who to report an incidence or error to but only a few of the respondents always practiced error reporting owing to numerous factors perceived as barriers to reporting of errors. There is an urgent need in Nigeria for the implementation of an error reporting system and for education about such a system.

REFERENCES

Abdel-Latif, M. M. M. (2016). Knowledge of healthcare professionals about medication errors in hospitals. *Journal of Basic and Clinical Pharmacy, 7*(3), 87-92. doi:10.4103/0976-0105.183264

Abubakar, A. R., Simbak, N. B., & Haque, M. (2014). *A Systematic Review of Knowledge, Attitude and Practice on Adverse Drug Reactions and Pharmacovigilance among Doctors* (Vol. 4). Terengganu, Malaysia.

Alboliteeh, M., & Almughim, I. M. (2017). The Knowledge, Attitude and Practice of Physicians and Nurses toward Adverse Event Reporting System in Primary Health Care Setting. *Journal of Patient Safety & Quality Improvement, 5*(1), 475-481. doi:10.22038/psj.2017.19980.1145

Ali, A.-Y. S., Khamis, M. L., & Salim, M. N. (2013). Nurses' Experiences toward Perception of Medication Administration Errors Reporting. *IOSR Journal of Nursing and Health Science (IOSR-JNHS), Volume 1*(ISSN: 2320–1940,), PP 56-70. doi:www.iosrjournals.org

Alsafi, E., Bahroon, S. A., Tamim, H., Al-Jahdali, H. H., Alzahrani, S., & Al Sayyari, A. (2011). Physicians' attitudes toward reporting medical errors-an observational study at a general hospital in Saudi Arabia. *J Patient Saf, 7*(3), 144-147. doi:10.1097/PTS.0b013e31822c5a82

Ayandiran, E. O., Irinoye, O. O., Olayiwola Faronbi, J., & Mtshali, N. G. (2013). Education reforms in Nigeria: how responsive is the nursing profession? *International Journal of Nursing Education Scholarship, 10*(1), 11-18.

Ayodele, B. C. (2011). Hospital information systems in Nigeria: a review of literature. *The Journal of Global Health Care Systems, 1*(3).

Bahadori, M., Ravangard, R., Aghili, A., Sadeghifar, J., Manshadi, M. G., & Smaeilnejad, J. (2013). The Factors Affecting the Refusal of Reporting on Medication Errors from the Nurses' Viewpoints: A Case Study in a Hospital in Iran. *ISRN Nursing*, 1-5 5p. doi:2013/876563

Bannigan, K., & Watson, R. (2009). Reliability and validity in a nutshell. *Journal of Clinical Nursing, 18*(23), 3237-3243 3237p. doi:10.1111/j.1365-2702.2009.02939.x

Barach, P., & Small, S. D. (2000). Reporting and preventing medical mishaps: lessons from non-medical near miss reporting systems. *British Medical Journal, 320*(7237), 759.

Bayazidi, S., Zarezadeh, Y., Zamanzadeh, V., & Parvan, K. (2012). Medication Error Reporting Rate and its Barriers and Facilitators among Nurses. *J Caring Sci, 1*(4), 231-236. doi:10.5681/jcs.2012.032

Brunsveld-Reinders, A. H., Arbous, M. S., De Vos, R., & De Jonge, E. (2016). Incident and error reporting systems in intensive care: a systematic review of the literature. *International Journal for Quality in Health Care, 28*(1), 2-13.

Carandang, R. R., Resuello, D., Hocson, G. B., Respicio, K. M., & Reynoso, C. (2015). Knowledge, Attitude and Practices on Medication Error Reporting among Health Practitioners from Hospitals in Manila. *Sch. Acad. J. Pharm., 4*(5), 293-300.

Chiang, H. Y., Lin, S. Y., Hsu, S. C., & Ma, S. C. (2010). Factors determining hospital nurses' failures in reporting medication errors in Taiwan. *Nursing Outlook, 58*(1), 17-25. doi:10.1016/j.outlook.2009.06.001

Covell, C. L., & Ritchie, J. A. (2009). Nurses' responses to medication errors: suggestions for the development of organizational strategies to improve reporting. *Journal of Nursing Care Quality, 24*(4), 287-297 211p. doi:10.1097/NCQ.0b013e3181a4d506

Donaldson, L. (2002). An organisation with a memory. *Clinical Medicine, 2*(5), 452-457.

Donaldson, M. S., Corrigan, J. M., & Kohn, L. T. (2000). *To err is human: building a safer health system* (Vol. 6): National Academies Press.

Elder, N. C., Graham, D., Brandt, E., & Hickner, J. (2007). Barriers and motivators for making error reports from family medicine offices: a report from the American Academy of Family Physicians National Research Network (AAFP NRN). *The Journal of the American Board of Family Medicine, 20*(2), 115-123.

Evans, S. M., Berry, J. G., Smith, B. J., Esterman, A., Selim, P., O'Shaughnessy, J., & DeWit, M. (2006). Attitudes and barriers to incident reporting: a collaborative hospital study. *Qual Saf Health Care, 15*(1), 39-43. doi:10.1136/qshc.2004.012559

Gallo, V., Egger, M., McCormack, V., Farmer, P. B., Ioannidis, J., Kirsch-Volders, M., . . . Stromberg, U. (2012). STrengthening the Reporting of OBservational studies in Epidemiology–Molecular Epidemiology (STROBE-ME): An extension of the STROBE statement. *European Journal of Clinical Investigation, 42*(1), 1-16.

Garbutt, J., Brownstein, D. R., Klein, E. J., Waterman, A., Krauss, M. J., Marcuse, E. K., . . . Gallagher, T. H. (2007). Reporting and disclosing medical errors: pediatricians' attitudes and behaviors. *Archives of Pediatrics and Adolescent Medicine, 161*(2), 179-185. doi:10.1001/archpedi.161.2.179

Garbutt, J., Waterman, A., Kapp, J. M., Dunagan, W. C., Levinson, W., Fraser, V., & Gallagher, T. H. (2008). Lost opportunities: how physicians communicate about medical errors. *Health Affairs, 27*(1), 246-255.

Garrouste-Orgeas, M., Philippart, F., Bruel, C., Max, A., Lau, N., & Misset, B. (2012). Overview of medical errors and adverse events. *Ann Intensive Care, 2*(1), 2. doi:10.1186/2110-5820-2-2

Grant, C., & Osanloo, A. (2014). Understanding, Selecting, and Integrating a Theoretical Framework in Dissertation Research: Creating the Blueprint for Your "House". *Administrative issues Journal, 4*(2), 4.

Green, B., Tsiroyannis, C., & Brennan, P. (2016). Human factors - recognising and minimising errors in our day to day practice. *Oral Diseases, 22*(1), 19-22. doi:10.1111/odi.12384

Greene, S. B., Williams, C. E., Pierson, S., Hansen, R. A., & Carey, T. S. (2010). Medication error reporting in nursing homes: identifying targets for patient safety improvement. *Quality & Safety In Health Care, 19*(3), 218-222 215p. doi:10.1136/qshc.2008.031260

Grove, S. K., Burns, N., & Gray, J. (2014). *Understanding nursing research: Building an evidence-based practice*: Elsevier Health Sciences.

Guilbert, J. (2006). The World Health Report 2006: working together for health. *Education for health (Abingdon, England), 19*(3), 385.

Hajibabaee, F., Joolaee, S., Peyravi, H., Alijany-Renany, H., Bahrani, N., & Haghani, H. (2014). Medication error reporting in Tehran: a survey. *Journal of Nursing Management, 22*(3), 304-310 307p. doi:10.1111/jonm.12226

Handler, S. M., Perera, S., Olshansky, E. F., Studenski, S. A., Nace, D. A., Fridsma, D. B., & Hanlon, J. T. (2007a). Identifying modifiable barriers to medication error reporting in the nursing home setting. *Journal of the American Medical Directors Association, 8*(9), 568-574 567p.

Handler, S. M., Perera, S., Olshansky, E. F., Studenski, S. A., Nace, D. A., Fridsma, D. B., & Hanlon, J. T. (2007b). Identifying modifiable barriers to medication error reporting in the nursing home setting. *Journal of the American Medical Directors Association, 8*(9), 568-574.

Hansson, E., Kohler, A., Skarsgård, N., & Larsso, S. (2015). How to Define Health Care Outcomes. Retrieved from https://www.bcgperspectives.com/content/articles/health-care-payers-providers-how-to-define-health-care-outcomes/

Härkänen, M., Saano, S., & Vehviläinen-Julkunen, K. (2017). Using incident reports to inform the prevention of medication administration errors. *Journal of Clinical Nursing*.

Hartnell, N., MacKinnon, N., Sketris, I., & Fleming, M. (2012). Identifying, understanding and overcoming barriers to medication error reporting in hospitals: a focus group study. *BMJ Qual Saf, 21*(5), 361-368. doi:10.1136/bmjqs-2011-000299

Heard, G. C., Sanderson, P. M., & Thomas, R. D. (2012). Barriers to adverse event and error reporting in anesthesia. *Anesthesia and Analgesia, 114*(3), 604-614. doi:10.1213/ANE.0b013e31822649e8

Hobgood, C., Weiner, B., & Tamayo-Sarver, J. H. (2006). Medical error identification, disclosure, and reporting: do emergency medicine provider groups differ? *Academic Emergency Medicine, 13*(4), 443-451.

Holden, R. J., & Karsh, B.-T. (2007). A review of medical error reporting system design considerations and a proposed cross-level systems research framework. *Human Factors: The Journal of the Human Factors and Ergonomics Society, 49*(2), 257-276.

Holden, R. J., & Karsh, B.-T. (2009). A theoretical model of health information technology usage behaviour with implications for patient safety. *Behaviour & Information Technology, 28*(1), 21-38.

http://www.clspectrum.com/archive/2014/February/images/cls_feb_3701.jpg.

Hung, C.-C., Chu, T.-P., Lee, B.-O., & Hsiao, C.-C. (2016). Nurses' attitude and intention of medication administration error reporting. *Journal of Clinical Nursing, 25*(3/4), 445-453 449p. doi:10.1111/jocn.13071

Hutton, A. C. (2017). *Assessing acquiescence in surveys using positively and negatively worded questions.* Virginia Commonwealth University.

Jafree, S. R., Zakar, R., Zakar, M. Z., & Fischer, F. (2016). Nurse perceptions of organizational culture and its association with the culture of error reporting: a case of public sector hospitals in Pakistan. *BMC Health Services Research, 16*(1), 3. doi:10.1186/s12913-015-1252-y

Jewell, K., & McGiffert, L. (2009). *To err is human, to delay is deadly: ten years later, a million lives lost, billions of dollars wasted*: Consumers Union.

Joolaee, S., Hajibabaee, F., Peyrovi, H., Haghani, H., & Bahrani, N. (2011). The relationship between incidence and report of medication errors and working conditions. *International Nursing Review, 58*(1), 37-44 38p. doi:10.1111/j.1466-7657.2010.00872.x

Julius, S., & Chris, W. C. (2005). The Kappa Statistic in Reliability Studies: Use, Interpretation, and Sample Size Requirements. *Physical Therapy, 85*.

Julius, S., & Wright, K. (2005). The Kappa Statistic in Reliability Studies: Use, Interpretation, and Sample Size Requirements. *Physical Therapy, , Volume 85:3*, 257-268.

Kaldjian, L. C., Jones, E. W., Wu, B. J., Forman-Hoffman, V. L., Levi, B. H., & Rosenthal, G. E. (2008). Reporting medical errors to improve patient safety: a survey of physicians in teaching hospitals. *Archives of Internal Medicine, 168*(1), 40-46.

Kalra, J., Kalra, N., & Baniak, N. (2013). Medical error, disclosure and patient safety: A global view of quality care. *Clinical Biochemistry, 46*(13–14), 1161-1169. doi:http://dx.doi.org/10.1016/j.clinbiochem.2013.03.025

Karanicolas, P. J., Bhandari, M., Kreder, H., Moroni, A., Richardson, M., Walter, S. D., . . . Guyatt, G. H. (2009). Evaluating agreement: conducting a reliability study. *Journal of Bone & Joint Surgery, American Volume, 91-A*, 99-106 108p. doi:10.2106/JBJS.H.01624

Karlsen, K. A., Hendrix, T. J., & O'Malley, M. (2009). Medical error reporting in America: a changing landscape. *Quality Management in Health Care, 18*(1), 59-70 12p. doi:10.1097/01.QMH.0000344594.48510.82

Kim, J., An, K., Kim, M. K., & Yoon, S. H. (2007). Nurses' perceptions of error reporting and patient safety culture in Korea. *Western Journal of Nursing Research, 29*(7), 827-844 818p.

Kohn, L. T., Corrigan, J. M., & Donaldson, M. S. (2000). Error reporting systems.

Kuo, G. M., Touchette, D. R., & Marinac, J. S. (2013). Drug errors and related interventions reported by United States clinical pharmacists: the American College of Clinical Pharmacy practice-based research network medication error detection, amelioration and prevention study. *Pharmacotherapy, 33*(3), 253-265. doi:10.1002/phar.1195

Labiran, A., Mafe, M., Onajole, B., & Lambo, E. (2008). Health workforce country profile for Nigeria. *Africa Health Workforce Observatory, 8*.

Lederman, R., Dreyfus, S., Matchan, J., Knott, J. C., & Milton, S. K. (2013). Electronic error-reporting systems: A case study into the impact on nurse reporting of medical errors. *Nursing Outlook, 61*(6), 417-426.e415 411p. doi:10.1016/j.outlook.2013.04.008

Levinson, D. R. (2012). Hospital Incident Reporting Systems Do Not Capture Most Patient Harm. (OEI-06-09-00091).

Louis, M. Y., Hussain, L. R., Dhanraj, D. N., Khan, B. S., Jung, S. R., Quiles, W. R., . . . Klarquist, L. J. (2016). Improving Patient Safety Event Reporting Among Residents and Teaching Faculty. *Ochsner J, 16*(1), 73-80.

Lynn, M. R. (1986). Determination and quantification of content validity. *Nursing Research, 35*(6), 382-385 384p.

Machin, D., Campbell, M. J., Tan, S. B., & Tan, S. H. (2009). Sample Size Tables for Clinical Studies.

Mahajan, R. P. (2010). Critical incident reporting and learning. *British Journal of Anaesthesia, 105*(1), 69-75. doi:10.1093/bja/aeq133

National Quality Forum (NQF). (2011). *Serious Reportable Events In Healthcare—2011 Update: A Consensus Report,* . Retrieved from Washinton DC.:

Nwozichi, C. (2015). Why are chemotherapy administration errors not reported? Perceptions of oncology nurses in a Nigerian tertiary health institution. *Asia-Pacific Journal of Oncology Nursing, 2*(1), 26. doi:10.4103/2347-5625.152403

Ock, M., Lim, S. Y., Jo, M.-W., & Lee, S.-I. (2017). Frequency, Expected Effects, Obstacles, and Facilitators of Disclosure of Patient Safety Incidents: A Systematic Review. *Journal Of Preventive Medicine And Public Health = Yebang Uihakhoe Chi, 50*(2), 68-82. doi:10.3961/jpmph.16.105

Ogundiran, T. O., & Adebamowo, C. A. (2012). Surgeon-patient information disclosure practices in southwestern Nigeria. *Medical Principles and Practice, 21*(3), 238-243. doi:10.1159/000333817

Okeke, J. O. (2008). *Shortage of health professionals: A study of recruitment and retention factors that impact rural hospitals in Lagos state, Nigeria*: ProQuest.

Oshikoya, K. A., Oreagba, I. A., Ogunleye, O. O., Senbanjo, I. O., MacEbong, G. L., & Olayemi, S. O. (2013). Medication administration errors among paediatric nurses in Lagos public hospitals: an opinion survey. *The International journal of risk & safety in medicine, 25*(2), 67-78.

Perez, B., Knych, S. A., Weaver, S. J., Liberman, A., Abel, E. M., Oetjen, D., & Wan, T. T. (2014). Understanding the barriers to physician error reporting and disclosure: a systemic approach to a systemic problem. *J Patient Saf, 10*(1), 45-51. doi:10.1097/PTS.0b013e31829e4b68

Pfeiffer, Y., Manser, T., & Wehner, T. (2010). Conceptualising barriers to incident reporting: a psychological framework. *Quality and Safety in Health Care*, qshc. 2008.030445.

Polit, D. F., & Beck, C. T. (2006). The content validity index: are you sure you know what's being reported? Critique and recommendations. *Research in Nursing and Health, 29*(5), 489-497. doi:10.1002/nur.20147

Polit, D. F., & Beck, C. T. (2012). *Resource Manual for Nursing Research: Generating and Assessing Evidence for Nursing Practice* (Ninth ed.): Wolters Kluwer Health | Lippincott Williams & Wilkins.

Polit, D. F., Beck, C. T., & Owen, S. V. (2007). Is the CVI an acceptable indicator of content validity? Appraisal and recommendations. *Research in Nursing and Health, 30*(4), 459-467. doi:10.1002/nur.20199

Poorolajal, J., Rezaie, S., & Aghighi, N. (2015). Barriers to Medical Error Reporting. *International Journal of Preventive Medicine, 6*, 97-97. doi:10.4103/2008-7802.166680

Sauro, J. (2011). Are both positive and negative items necessary in questionnaires. *Retrieved June, 20*, 2013.

Schiff, G. D., Hasan, O., Kim, S., Abrams, R., Cosby, K., Lambert, B., . . . Krosnjar, N. (2009). Diagnostic error in medicine: analysis of 583 physician-reported errors. *Archives of Internal Medicine, 169*(20), 1881-1887.

Schultz, T. J., Crock, C., Hansen, K., Deakin, A., & Gosbell, A. (2014). Piloting an online incident reporting system in Australasian emergency medicine. *Emergency Medicine Australasia, 26*(5), 461-467. doi:10.1111/1742-6723.12271

Servicom Unit FETHI. (2016). The Servicom Charter for the Federal Teaching HospitalL, Ido-Ekiti, Nigeria. Retrieved from https://www.fethi.org.ng/article/ds-2016-01-13-955-.html

Shaibu, B., & Muhammad, U. (2011). Knowledge and attitudes of physicians relating to reporting of adverse drug reactions in Sokoto, north-western Nigeria. *Annals of African Medicine*.

Smith, K. S., Harris, K. M., Potters, L., Sharma, R., Mutic, S., Gay, H. A., . . . Terezakis, S. (2014). Physician attitudes and practices related to voluntary error and near-miss reporting. *Journal of Oncology Practice, 10*(5), e350-357. doi:10.1200/jop.2013.001353

Soydemir, D., Seren Intepeler, S., & Mert, H. (2016). Barriers to Medical Error Reporting for Physicians and Nurses. *Western Journal of Nursing Research*, 1-16. doi:10.1177/0193945916671934

Suresh, K., Thomas, S. V., & Suresh, G. (2011). Design, data analysis and sampling techniques for clinical research. *Annals of Indian Academy of Neurology, 14*(4), 287.

Todar, T. L., Agrawal, M., Hishikar, R., Jha, A., Maheshwari, B., & Joshi, U. (2017, 2017/04//). Knowledge, attitude and practice toward adverse drug reaction reporting among practicing clinicians at a tertiary care hospital. *International Journal of Basic & Clinical Pharmacology, 6,* 845+.

Uribe, C. L., Schweikhart, S. B., Pathak, D. S., Dow, M., & Marsh, G. B. (2002). Perceived Barriers to Medical-Error Reporting: An Exploratory Investigation. *Journal of Healthcare Management, 47*(4), 263.

Vincent, C. (2012). The essentials of patient safety. *Download disponibile all'indirizzo www1. imperial. ac. uk/medicine/about/institutes/patientsafetyservicequality*.

Von Elm, E., Altman, D. G., Egger, M., Pocock, S. J., Gøtzsche, P. C., Vandenbroucke, J. P., & Initiative, S. (2007). The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *Preventive Medicine, 45*(4), 247-251.

Wagner, L. M., Castle, N. G., & Handler, S. M. (2013). Use of HIT for adverse event reporting in nursing homes: Barriers and facilitators. *Geriatric Nursing, 34*(2), 112-115.

Wagner, L. M., Harkness, K., Hébert, P. C., & Gallagher, T. H. (2012). Nurses' perceptions of error reporting and disclosure in nursing homes. *Journal of Nursing Care Quality, 27*(1), 63-69.

Waterman, A. D., Garbutt, J., Hazel, E., Dunagan, W. C., Levinson, W., Fraser, V. J., & Gallagher, T. H. (2007). The emotional impact of medical errors on practicing physicians in the United States and Canada. *The Joint Commission Journal on Quality and Patient Safety, 33*(8), 467-476.

Westat, R., Sorra, J., Famolaro, T., Dyer, M. N., Khanna, K., & Nelson, D. (2010). Hospital Survey on Patient Safety Culture: 2010 User Comparative Database Report.

Williams., S., Manwell, L. B., Konrad, T. R., & Linzer, M. (2007). The relationship of organizational culture, stress, satisfaction, and burnout with physician-reported error and suboptimal patient care: results from the MEMO study. *Health Care Management Review, 32*(3), 203-212.

Wolf, Z. R., & Hughes, R. G. (2008a). Advances in Patient Safety

Error Reporting and Disclosure. In R. G. Hughes (Ed.), *Patient Safety and Quality: An Evidence-Based Handbook for Nurses*. Rockville (MD): Agency for Healthcare Research and Quality (US).

Wolf, Z. R., & Hughes, R. G. (2008b). Error Reporting and Disclosure. *Patient Safety and Quality: An Evidence-Based Handbook for Nurses*.

World Alliance For Patient Safety Drafting Group, Sherman, H., Castro, G., Fletcher, M., Hatlie, M., Hibbert, P., . . . Loeb, J. (2009). Towards an International Classification for Patient Safety: the conceptual framework. *International Journal for Quality in Health Care, 21*(1), 2-8.

World Health Organization. (2014). Reporting and learning systems for medication errors: the role of pharmacovigilance centres.

World Medical Association. (2013). World Medical Association Declaration of Helsinki: ethical principles for medical research involving human subjects. *JAMA, 310*(20), 2191.

Yaghmale, F. (2009). Content validity and its estimation. *Journal of Medical Education, 3*(1).

Yung, H.-P., Yu, S., Chu, C., Hou, I. C., & Tang, F.-I. (2016a). Nurses' attitudes and perceived barriers to the reporting of medication administration errors. *Journal of Nursing Management, 24*(5), 580-588 589p. doi:10.1111/jonm.12360

Yung, H. P., Yu, S., Chu, C., Hou, I. C., & Tang, F. I. (2016b). Nurses' attitudes and perceived barriers to the reporting of medication administration errors. *Journal of Nursing Management, 24*(5), 580-588. doi:10.1111/jonm.12360

Yung, H. P., Yu, S., Chu, C., Hou, I. C., & Tang, F. I. (2016c). Nurses' attitudes and perceived barriers to the reporting of medication administration errors. *Journal of Nursing Management*. doi:10.1111/jonm.12360

Zaheer, S., Ginsburg, L., You-Ta, C., & Grace, S. L. (2015). Patient safety climate (PSC) perceptions of frontline staff in acute care hospitals: Examining the role of ease of reporting, unit norms of openness, and participative leadership. *Health Care Management Review, 40*(1), 13-23. doi:10.1097/HMR.0000000000000005

Appendices

Appendix A: Respondents' information sheet

Informed consent form

Survey questionnaire

Survey questionnaire (53 item) originally designed before validation

Appendix B: Checklist for content validity of the survey questionnaire

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Rating scale for CVI

Appendix C: Summary of findings of CVI

Appendix D: Summary of findings of IRR

Items removed from the final questionnaire following IRR.

Appendix E: Negatively-worded questions re-coded

Appendix F: Ethics approval obtained from the UCT Faculty of Health Sciences, Human Research Ethic Committee

Appendix G: Ethics Approval obtained from the FETHI

Appendix H: Ethics Approval obtained from the SSHA

Appendix A

Participant Code number……

Participant Information sheet

Title of study: Self-reported perception of factors influencing error reporting in a Nigerian hospital: a descriptive cross-sectional study.

Introduction: The incidence of error in healthcare has been found to be enormous as a result of individual/personal and environmental factors such as fear of punishment, sense of shame and inaccessible/non-functioning error reporting system respectively. These factors have predisposed patients to temporary or permanent hazards when doctors and nurses fail in their capacity as health professionals to report errors to their institution for prompt and appropriate measures to be implemented.

What is the aim of the study?

The aim of the study is to explore doctors' and nurses' self-reported perceptions of factors influencing error reporting in a Nigerian hospital by survey questionnaire.

Does the study have ethical approval?

Ethical approval (HREC REF 675/2016) has been obtained from the UCT Faculty of Health Sciences' Human Research Ethics Committee and approval has been obtained from your institution's research development committee.

Who is involved in the study?

Doctors and nurses at your hospital.

Why am l chosen to participate in the study?

You have been invited to participate in the study because you are either a nurse or doctor directly involved in patient care in any clinical area/department who have been practicing as a registered professional for not less than one year.

What is the research procedure? What is required of me?

You are provided with an information sheet, consent form and 5-part questionnaire. You are required to familiarize yourself with the contents of these documents. If you agree to participate in the study you are requested to complete and sign 2 copies of the consent form and to give 1 copy to the researcher. The researcher (details at the end of the questionnaire) will ask you to complete the questionnaire in their presence so that they may clarify aspects of the questionnaire that may be unclear to you, if you are unable to complete it, you can take it home to later submit in the box at your ward reception. The 5 sections of the questionnaire comprise of: A) socio-demographic characteristics, B) awareness of and the use of an error reporting system, C) frequency of reporting various types of errors, D) perceptions of factors that serve as barriers to error reporting and E) perceptions of factors that may facilitate an error reporting culture. The completed questionnaire will be given to the researcher after completion or placed in a box in a specified part of the ward/department and marked as "COMPLETED QUESTIONNAIRES FOR O. AFOLALU'S PROJECT".

What will be the risk and benefit if you decide to participate?

There are no foreseen risks, adverse effects or hazards in participating in this study. Information provided by you is anonymous (note the code number above) and will be kept confidential in a locked cupboard. Only the researcher has access to the cupboard.

The study is not intended to test your clinical skill or ability, but to seek your opinions of factors that are barriers and factors that facilitate error reporting.

How much time will it take me to complete the questionnaire?

It will take you about 15 minutes to read and complete the questionnaire.

Do l have the voluntary will or right to withdraw from the study?

You are not forced to participate in the study and you have every right to withdraw from the study without any penalty.

What will happen to the findings of the study and how can it be disseminated?

The study findings will be analyzed and discussed and recommendations will be made. An executive summary will be provided to the institution. Findings will be disseminated through peer-reviewed journals and conference presentations while anonymity of the hospital and participants will be maintained. Data will be copied onto a CD for safekeeping in a secure environment for 3 years.

Financial benefits

No financial benefits are payable for participating in this study.

Conflict of Interest

The researcher hereby declares that there are no conflicts of interest.

Contact details should you have questions or need clarification:

Researcher: AFOLALU Olamide Olajumoke Msc candidate Division of Nursing and Midwifery, Department of Health and Rehabilitation Sciences Faculty of Health Sciences University of Cape Town, South Africa Telephone Number: +27632366305 Email: aflola002@myuct.ac.za	**Supervisor:** Dr Una Kyriacos Division of Nursing and Midwifery Department of Health and Rehabilitation Sciences Faculty of Health Sciences University of Cape Town, South Africa Observatory 7925 Telephone Number: *+27 21 4066410* Email: una.kyriacos@uct.ac.za

HUMAN RESEARCH ETHICS COMMITTEE:
Professor Marc Blockman
Faculty of Health Sciences
Human Research Ethics Committee
Room E52-24 Groote Schuur Hospital Old Main Building
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TEL: 021-406 6626

Informed Consent Form for participants

Title of study: Self-reported perceptions of factors influencing error reporting in a Nigerian hospital: a descriptive cross-sectional study.

Research team: AFOLALU Olamide Olajumoke (MSc candidate), Supervisor: Una Kyriacos PhD

	Initial
1. I confirm that I have read and understand the information sheet for the above study (dated January 2017) and have had the support and opportunity to ask questions.	
2. I am aware that all my details (name and signature) on this consent form will not appear on the emerging data and my response will be confidential.	
3. I understand that my participation in the study will not affect the conditions of my employment.	
4. I am aware that I can withdraw from the study at any time without penalty.	
5. I am aware that there are no physical risks or anticipated risks involved.	
6. I am aware that benefits to me include improved understanding of factors that facilitate error reporting.	
7. I consent to take part in this study and have reached this decision without being forced or placed under undue pressure.	

Print name of participant: Signature: Date:

Print name of researcher: AFOLALU Olamide Olajumoke Signature: Date:

This study is being conducted by the University of Cape Town. The study is based on the research supported in part by the National Research Foundation of South Africa for the Grant Reference: SFH160615171759, UID: 107108.

When complete: original copy to be kept by the researcher. Please offer a second copy to the participant for own records.

Title of study: Self-reported perceptions of factors influencing error reporting in a Nigerian hospital: a descriptive cross-sectional study.

QUESTIONNAIRE

Section A: Socio demographic characteristics of the participants.

Instructions: Please fill in the required information in blank spaces and tick (✓) other boxes as appropriate.

1	What is your age?				
2	What is your gender?		Male	Female	
3	What is your profession?		Nurse	Doctor	
4	What is your professional qualification?	Nursing Diploma	Bachelor of Nursing Science	MBBS/MD/MOD	Masters/PhD
5	How many years of work experience have you?				
6	What is your current work status		Part time	Full time	

Section B: Awareness of and use of an incident/error reporting system

	Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
7	This hospital has a system for reporting errors					
8	I know where and when to report					
9	I have never reported an incident or error I was involved in					
10	I do not know how to locate an incident form					
11	I do not know who to report an incidence or error to.					

Adapted from reference (Evans et al., 2006) with permission.

Section C: Frequency of reporting various types of errors

	Statement	Never	Occasionally	Always
12	Wrong drug prescribed and administered requiring treatment and prolonging hospitalization.			
13	Equipment fault resulting in patient harm			
14	Serious error like delay in patients' treatment resulting in death.			
15	Communication error resulting in breach of patients' confidentiality			
16	Infection acquired during hospital stay			
17	Pressure sore acquired during hospital care			
18	Diagnostic errors that can cause serious disability or death			
19	Haemolytic reaction due to the administration of ABO-incompatible blood or blood products			

Adapted from reference: (Evans et al., 2006) with permission.

Section D: Perceived Barriers to Error Reporting

	Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree5
20	There is positive feedback when errors are reported.					
21	I am not afraid of any adverse consequences of making a report such as litigation.					
22	My colleagues will be unsupportive and cast blame on me.					
23	When an error occurs, much focus is on the individual without looking at organizational/system errors					
24	My patient will lose trust in me and feel unsafe in my presence.					
25	The response by supervisors/administrators does not match the severity of the error					
26	There is no point reporting an error that did not cause harm.					
27	Making a report is not time consuming.					
28	When I don't know whose responsibility it is to make a report.					
29	When l do not consider an incident to be an error.					
30	Error reporting system is not effective in my hospital.					
31	The form is easy to fill in.					
32	The task l engage in at work makes me remember to report an error.					
33	There is no confidentiality of errors reported.					
34	As long as the staff involved learn from incidents it is unnecessary to discuss them further.					

Adapted from reference (Heard et al., 2012) with permission.

Section E: Perceived factors that facilitate an error reporting culture

	Statement	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
35	Generalized feedback about reports received from the hospital reporting system.					
36	Individualized feedback to you about reports you submit.					
37	Role models, e.g. senior colleagues, departmental directors who openly encourage reporting.					
38	Legislated protection of information provided from use in litigation.					
39	Anyone may report anonymously.					
40	The purpose and implementation of reporting systems should be addressed clearly.					
41	More blame attached to those who report errors.					
42	Access to computer-based reporting systems from home, phone or hotline reporting.					
43	Education about the purpose of reporting.					
44	Clear guidelines about what adverse events and errors to report and who should report.					
45	Training on how information should be reported and what should be done with reports.					
46	Information on how confidentiality will be maintained if you supply your name.					
47	Incentives for time taken to report.					

Adapted from reference (Heard et al., 2012) with permission.

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***Supervisor**: Dr Una Kyriacos*
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Survey Questionnaire Originally Designed before Validation

Title of study: Self-reported perceptions of factors that influencing error reporting in a Nigerian hospital: a descriptive cross-sectional study.

QUESTIONNAIRE

Section A: Socio demographic characteristics of the participants.

Instructions: Please fill in the required information in blank spaces and tick other boxes as appropriate.

1	What is your age?				
2	What is your gender?		Male		Female
3	What is your profession?		Nurse		Doctor
4	What is your professional qualification?	Nursing Diploma	Bachelor of Nursing Science	MBBS/MD/MOD	Masters/PhD
5	How many years of work experience have you?				
6	What is your current work status		Part time		Full time

Section B: Awareness of and use of an incident/error reporting system

	Statement	Strongly Agree 1	Agree 2	Neutral 3	Disagree 4	Strongly Disagree 5
7	I do not know if this hospital has a system for reporting errors					
8	I know where and when to report					
9	I have never reported an incident or error I was involved in					
10	I have reported an incident committed by a colleague					
11	I do not know how to locate an incident form					
12	I know what to do with a completed form					
13	I do not know who to report an incidence or error to.					

Adapted from reference (Evans et al., 2006) with permission.

Section C: Frequency of reporting various types of errors

	Statement	Never 1	Occasionally 2	Always 3
14	Minor errors such as patient falls with resultant injury.			
15	Wrong drug prescribed and administered requiring treatment and prolonging hospitalization.			
16	Patient received wrong treatment or procedure.			
17	Equipment fault resulting in patient harm			
18	Serious error like delay in patients' treatment resulting in death.			
19	Communication error resulting in breach of patients' confidentiality			
20	Infection acquired during hospital stay			
21	Pressure sore acquired during hospital care			
22	Diagnostic error that can cause serious disability or death			
23	Haemolytic reaction due to the administration of ABO-incompatible blood or blood products			

Adapted from reference: (Evans et al., 2006) with permission.

Section D: Perceived Barriers to Error Reporting

	Statement	Strongly Agree 1	Agree 2	Neutral 3	Disagree 4	Strongly Disagree 5
24	There is positive feedback when errors are reported.					
25	I am not afraid of any adverse consequences of making a report such as litigation.					
26	My colleagues will be unsupportive and cast blame on me.					
27	When an error occurs, much focus is on the individual without looking at organizational/system errors					
28	My patient will have trust in me and feel safe in my presence.					
29	The response by supervisors/administrators does not match the severity of the error					
30	There is no point reporting an error that did not cause harm.					
31	Making a report is not time consuming.					
32	When I don't know whose responsibility it is to make a report.					
33	When l do not consider an incident to be an error.					
34	Error reporting system is not effective in my hospital.					
35	The form is easy to feel.					
36	The task l engage in at work makes me remember to report an error.					
37	There is confidentiality of errors reported.					
38	As long as the staff involved learn from incidents it is unnecessary to discuss them further.					

Adapted from reference (Heard et al., 2012) with permission.

Section E: Perceived factors that facilitate an error reporting culture

	Statement	Strongly Agree 1	Agree 2	Neutral 3	Disagree 4	Strongly Disagree 5
39	Generalized feedback about reports received from the hospital reporting system.					
40	Individualized feedback to you about reports you submit.					
41	Role models, e.g. senior colleagues, departmental directors who openly encourage reporting.					
42	Legislated protection of information provided from use in litigation.					
43	Inability to make a report anonymously.					
44	Lack of access to paper forms for reporting.					
45	Lack of support from colleagues.					
46	The purpose and implementation of reporting systems should be addressed clearly.					
47	More blame attached to those who report errors.					
48	Access to computer-based reporting systems from home, phone or hotline reporting.					
49	Education about the purpose of reporting.					
50	Clear guidelines about what adverse events and errors to report and who should report.					
51	Training on how information should be reported and what should be done with reports.					
52	Information on how confidentiality will be maintained if you supply your name.					
53	No payment for time taken to report.					

Adapted from reference (Heard et al., 2012) with permission.

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Appendix B

Index of Content Validity (CVI)

Checklist for content validity of the survey questionnaire

Title of study: **Self-reported perceptions of factors that influencing Error Reporting in a Nigerian Hospital: A Descriptive Cross-sectional Study.**

INFORMATION SHEET FOR EXPERTS

Thank you for agreeing to evaluate the content of the questionnaire and face validity as discussed at our last meeting. Kindly scan and send the completed checklist to the researcher's e mail or mail the hard copy to my supervisor at the Division of Nursing and Midwifery. If l do not receive your response after 2 weeks, l will assume you are not able to complete the evaluation. There is no penalty for refusing to participate. If I do not receive your signed consent form but if the completed form is returned, it is assumed you have consented to participate. If you have any questions about the checklist or the study, do not hesitate to contact the researcher or supervisor on the telephone numbers or e-mail addresses as stated at the end of the document.

What is the aim of the study?

The aim of the study is to explore doctors' and nurses' self-reported perceptions of factors influencing error reporting in a Nigerian hospital by survey questionnaire.

Purpose of the Rating

The purpose of this checklist for content validity is to achieve authenticity, that is, to ensure all concepts relevant to the construct of interest are included in the instrument and assure directness.

Does the study have ethical approval?

Ethical approval (HREC REF 675/2016) has been obtained from the UCT Faculty of Health Sciences' Human Research Ethics Committee and approval has been obtained from your institution's research development committee.

Why am l chosen to participate in the study?

You have been invited to participate in the study because you have clinical expertise, working experience and knowledge of clinical/health science research and that you are familiar with and might have had experience of medical errors in the course of your work experience and practice.

What is the research procedure? What is required of me?

The questionnaire consists of 5 sections with a total number of 53 items. An index of content validity (CVI) checklist for each items is attached to be rated on a 4 point ordinal rating scale ranging from irrelevant to extremely relevant. The CVI for each item is the proportion of experts who rate the item as a 3 or 4 on a 4-point scale (Polit et al., 2007). The CVI for the entire questionnaire is the proportion of the total number of items which are found to be valid. Therefore 53 items are presented to be rated to ensure appropriateness of the questionnaire for the study. If you discover the need for additions or omissions in any of the item, these can be listed alongside each item.

To evaluate the face validity of the questionnaire, you are asked to consider the following aspects: layout, format, quality of printing, length of the questionnaire, response scales for Sections B to E, if visually easy to read, if visually easy to comprehend and if instructions at the beginning of the questionnaire are clear and easy to understand.

What will be the risk and benefit if you decide to participate?

There are no foreseen risks, adverse effects or hazards in validating this study. All information provided by you is anonymous therefore a code number is used and will be kept confidential and all questions posed will be used only for the purpose of the study. It is also not intended to test your clinical skill or ability.

How long will it take me to complete the questionnaire?

It will take you about 45 minutes to read and complete the questionnaire.

Do l have the right to withdraw from the study?

You are asked to participate voluntarily and will not be forced to participate in the study and you have every right to withdraw from the study without any penalty.

What will happen to the findings of the study and how can it be disseminated?

The study findings will be analyzed and discussed and recommendations will be made. An executive summary will be provided to the institution Findings will be disseminated through peer-reviewed journals and conference presentations while anonymity of the hospital and participants will be maintained. Data will be copied onto a CD for safekeeping in a secure environment for 3 years.

Conflict of Interest:

The researcher hereby declares that there are no conflicts of interest.

Contact details should you have questions or need clarification:

Researcher: Afolalu Olamide Olajumoke (Msc candidate Division of Nursing and Midwifery, Department of Health and Rehabilitation Sciences Faculty of Health Sciences University of Cape Town, South Africa Telephone Number: +27632366305 Email: aflola002@myuct.ac.za	**Supervisor:** Dr Una Kyriacos Division of Nursing and Midwifery Department of Health and Rehabilitation Sciences Faculty of Health Sciences University of Cape Town, South Africa Observatory 7925 Telephone Number: *+27 21 4066410* Email: una.kyriacos@uct.ac.za

HUMAN RESEARCH ETHICS COMMITTEE:

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Human Research Ethics Committee
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Informed Consent Form for validating experts

Expert code number:

Title of study: Self-reported perceptions of factors that influencing error reporting in a Nigerian hospital: a descriptive cross-sectional study.

Research team: Afolalu Olamide Olajumoke MSc candidate, Supervisor: Una Kyriacos PhD

	Initial
1. I (the professional expert) confirm that I have read and understand the information sheet for the above study (dated December 2016) and have had the support and opportunity to ask questions.	
2. I am aware that all my details (name and signature) on this consent form will not appear on the emerging data and my response will be confidential.	
3. I understand that my participation in the study will not affect the conditions of my employment.	
4. I am aware that I can withdraw from the study at any time without penalty.	
5. I am aware that there are no physical risks or anticipated risks involved.	
6. I am aware that benefits to me include improved understanding of factors that facilitate error reporting.	
7. I consent to take part in this study and have reached this decision without being forced or placed under undue pressure.	

Print name of participant: Signature: Date:

Print name of researcher: AFOLALU Olamide Olajumoke Signature: Date:

This study is being conducted by the University of Cape Town. The study is based on the research supported in part by the National Research Foundation of South Africa for the Grant Reference: SFH160615171759, UID: 107108.

When complete: original copy to be kept by the researcher. Please offer a second copy to the participant for own records.

Rating scale for CVI

A 5-part questionnaire on self-reported perceptions of factors that influence Error Reporting in a Nigerian hospital is itemized below. Sections B, C, D and E of the questionnaire are rated on a 5 point Likert scale as: Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree.

Section B: Awareness of and use of the incident/error reporting system

	Items	**Irrelevant (1)**	**Item not relevant until modification is made (2)**	**Relevant but needs minor correction (3)**	**Extremely relevant (4)**	**Comments**
	Section A: Socio demographic Characteristics of the participants.					
1	What is your age?					
2	What is your gender? Female ( ) Male ()					
3	What is your profession? a)Nurse b)Doctor					
4	What is your professional qualification? a) Diploma b) BNSc c) MBBS/MOD d)Masters/PhD					
5	How many years of work experience have you?					
6	What is your current work status a) Full time b) Part time					

	Items	Irrelevant (1)	Item not relevant until modification is made (2)	Relevant but needs minor correction (3)	Extremely relevant (4)	Comments
	Section B: Awareness and use of the incident/error reporting system					
7	I do not know if this hospital has a system for reporting errors					
8	I know where and when to report					
9	I have never reported an incident or error I was involved in					
10	I have reported an incident committed by a colleague					
11	I do not know how to locate an incident form					
12	I know what to do with a completed form					
13	I do not know who to report an incidence or error to.					
	Section C Frequency of reporting various types of errors					
14	Minor errors such as patient falls with resultant injury.					
15	Wrong drug prescribed and administered requiring treatment and prolonging hospitalization.					
16	Patient received wrong treatment or procedure.					
17	Equipment fault resulting in patient harm					
18	Serious error like delay in patients' treatment resulting in death.					
19	Communication error resulting in breach of patients' confidentiality					
20	Infection acquired during hospital stay					
21	Pressure sore acquired during hospital care					
22	Diagnostic error that can cause serious disability or death					

	Items	Irrelevant (1)	Item not relevant until modification is made (2)	Relevant but needs minor correction (3)	Extremely relevant (4)	Comments
23	Haemolytic reaction due to the administration of ABO-incompatible blood or blood products					
	Section D: Perceived Barriers to Error Reporting					
24	There is positive feedback when errors are reported.					
25	I am not afraid of any adverse consequences of making a report such as litigation.					
26	My colleagues will be unsupportive and cast blame on me.					
27	When an error occurs, much focus is on the individual without looking at organizational/system errors					
28	My patient will have trust in me and feel safe in my presence.					
29	The response by supervisors/administrators does not match the severity of the error					
30	There is no point reporting an error that did not cause harm.					
31	Making a report is not time consuming.					
32	When I don't know whose responsibility it is to make a report.					
33	When l do not consider an incident to be an error.					
34	Error reporting system is not effective in my hospital.					
35	The form is easy to feel.					
36	The task l engage in at work makes me remember to report an error.					
37	There is confidentiality of errors reported.					

	Items	Irrelevant (1)	Item not relevant until modification is made (2)	Relevant but needs minor correction (3)	Extremely relevant (4)	Comments
	Section E: Factors that facilitate error reporting					
38	As long as the staff involved learn from incidents it is unnecessary to discuss them further.					
39	Generalized feedback about reports received from the hospital reporting system.					
40	Individualized feedback to you about reports you submit.					
41	Role models, e.g. senior colleagues, departmental directors who openly encourage reporting.					
42	Legislated protection of information provided from use in litigation.					
43	Inability to make report anonymously.					
44	Lack of access to paper forms for reporting.					
45	Lack of support from colleagues.					
46	The purpose and implementation of reporting systems should be addressed clearly.					
47	More blame attached to those who report errors.					
48	Access to computer-based reporting systems from home, phone or hotline reporting.					
49	Education about the purpose of reporting.					
50	Clear guidelines about what adverse events and errors to report and who should report.					
51	Training on how information should be reported and what should be done with reports.					
52	Information on how confidentiality will be maintained if you supply your name.					
53	No payment for time taken to report.					

Assessment of face validity

	Very skillful	Satisfactory	Needs improvement	Unacceptable	Comments
Layout					
Format					
Quality of printing					
Length of the questionnaire					
The response scale of Section B					
The response scale of Section C					
The response scale of Section D					
The response scale of Section E					
The response scale of Section F					
If visually easy to read					
If visually easy to comprehend					
If instructions at the beginning of the questionnaire are clear and easy to understand					

Adapted with permission from Kyriacos (2011).

THANK YOU

References

1. Lynn, M. R. Determination and quantification of content validity. *Nursing Research* 1986; 35 (6 November/December):382-85.
2. DeVon, H. A., Block, M. E., Moyle-Wright, P., Ernst, D. M., Hayden, S. J., Lazzara, D. J., . . . Kostas-Polston, E. (2007). A psychometric toolbox for testing validity and reliability. *Journal of Nursing Scholarship, 39*(2), 155-164 110p. doi:10.1111/j.1547-5069.2007.00161.x
3. Adapted with permission from: Kyriacos, U. 2011. The development, validation and testing of a vital signs monitoring tool for early identification of deterioration in adult surgical patients. PhD thesis. Cape Town: University of Cape Town.
4. Polit, D. F., Beck, C. T., & Owen, S. V. (2007). Is the CVI an acceptable indicator of content validity? Appraisal and recommendations. *Research in Nursing and Health, 30*(4), 459-467. doi:10.1002/nur.20199

Appendix C:

Results of CVI: Expert opinion (n=4) on index of content validity (CVI) of each item on the survey questionnaire

Index of Content Validity							
Section/ Item	1=irrelevant	2=unable to assess relevance without item revision or item is in need of such revision that it would no longer be relevant	3= relevant but needs minor correction	4=extremely relevant	Items ranking 3 and 4	Median score for this item [correct all from excel]	Comments
Section A: Socio demographic characteristics of the respondents.							
Item 1: Age	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 2: Gender	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 3: Profession	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 4: Professional qualification	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 5: Work experience	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 6: Work status	0	0	0	4 (100%)	4 (100%)	0	No changes *
Section B: Awareness and use of the incident/error reporting system							
Item 7: system for reporting errors	0	0	1 (25%)	3 (75%)	4 (100%)	0.5	Removal of "I do not know". This change was made. *
Item 8: I know where and when to report	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 9: Never reported an incident	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 10: Have reported an incident	0	0	1 (25%)	3 (75%)	4 (100%)	0.5	Addition of "before" to the end of the statement was suggested – but no change was made after discussions with research supervisor.* #
Item 11: I do not know how to locate an incident form	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 12: I know what to do with a completed form	0	0	0	4 (100%)	4 (100%)	0	No changes * #
Item 13: I do not know who to report an incidence or error to.	0	0	0	4 (100%)	4 (100%)	0	No changes *

Index of Content Validity							
Section/ Item	1=irrelevant	2=unable to assess relevance without item revision or item is in need of such revision that it would no longer be relevant	3= relevant but needs minor correction	4=extremely relevant	Items ranking 3 and 4	Median score for this item [correct all from excel]	Comments
Section C Frequency of reporting various types of errors							
Item 14: patient falls with resultant injury.	0	0	1 (25%)	3 (75%)	4 (100%)	0.5	Patient fall could be a minor or major error depending on the severity, so why not consider modifying the question to "Patient falls with resultant injury". This change was made. * #
Item 15: Wrong drug prescribed and administered	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 16: Wrong treatment or procedure	0	0	0	4 (100%)	4 (100%)	0	No changes * #
Item 17: Equipment fault resulting in patient harm	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 18: Serious error like delay in patients' treatment resulting in death.	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 19: Communication error	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 20: Infection acquired during hospital stay	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 21: Pressure sore acquired during hospital care	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 22: Diagnostic error that can cause serious disability or death	0	0	1 (25%)	3 (75%)	4 (100%)	0.5	There are different kinds of diagnostic errors that can occur in the laboratory, so it should be stated as "diagnostic errors" and not "diagnostic error". This change was made. *
Item 23: Haemolytic reaction	0	0	0	4 (100%)	4 (100%)	0	No changes *

Index of Content Validity							
Section/ Item	1=irrelevant	2=unable to assess relevance without item revision or item is in need of such revision that it would no longer be relevant	3= relevant but needs minor correction	4=extremely relevant	Items ranking 3 and 4	Median score for this item [correct all from excel]	Comments
Section D: Perceived Barriers to Error Reporting							
Item 24: Positive feedback when errors are reported.	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 25: I am not afraid of any adverse consequences	0	0	1 (25%)	3 (75%)	4 (100%)	0.5	Removal of "I am not" and modification to "Fear of adverse..." No changes were made as negatively worded are required. *
Item 26: My colleagues will be unsupportive and cast blame on me.	0	0	1 (25%)	3 (75 %)	4 (100%)	0.5	Complete the statement as "My colleagues will be unsupportive and cast blame on me if errors result from me". No changes were made. *
Item 27: focus is on the individual without looking at organizational/ system errors	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 28: My patient will have trust in me and feel safe in my presence.	0	0	1 (25%)	3 (75%)	4 (100%)	0.5	Addition of "lose" and "unsafe" *
Item 29: The response by supervisors/administrators does not match the severity of the error	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 30: There is no point reporting an error that did not cause harm.	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 31: Making a report is not time consuming.	0	0	1 (25%)	3 (75%)	4 (100%)	0.5	Modify question to "Making a report is time consuming". No change was made as negatively worded items should be included. *

Index of Content Validity							
Section/ Item	1=irrelevant	2=unable to assess relevance without item revision or item is in need of such revision that it would no longer be relevant	3= relevant but needs minor correction	4=extremely relevant	Items ranking 3 and 4	Median score for this item [correct all from excel]	Comments
Item 32: Don't know whose responsibility it is to make a report.	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 33: When l do not consider an incident to be an error	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 34: Error reporting system is not effective in my hospital.	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 35: The form is easy to feel.	0	0	4 (100%)	0	4 (100%)	0	Typographical error. Replacement of the word "feel with fill in" *
Item 36: The task l engage in at work makes me remember to report an error.	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 37: There is confidentiality of errors reported.	0	0	1 (25%)	3 (75%)	4 (100%)	0.5	Modify question to "There is no confidentiality of errors reported." *
Section E: Factors that facilitate error reporting							
Item 38: As long as the staff involved learn from incidents it is unnecessary to discuss them further.	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 39: Generalized feedback	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 40: Individualized feedback to you about reports you submit.	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 41: Role models, e.g. senior colleagues, departmental directors who openly encourage reporting	0	0	0	4 (100%)	4 (100%)	0	No changes *

Index of Content Validity							
Section/ Item	1=irrelevant	2=unable to assess relevance without item revision or item is in need of such revision that it would no longer be relevant	3= relevant but needs minor correction	4=extremely relevant	Items ranking 3 and 4	Median score for this item [correct all from excel]	Comments
Item 42: Legislated protection of information provided from use in litigation.	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 43: Inability to make report anonymously	0	0	2 (50%)	2 (50%)	4 (100%)	1	Statement was modified to "Anyone may report anonymously" Change was made. *
Item 44: Lack of access to paper forms for reporting.	0	0	1 (25%)	3 (75%)	4 (100%)	0.5	Modify question to "Access to paper forms for reporting" No change was made as negatively worded items should be included. * #
Item 45: Lack of support from colleagues.	0	0	1 (25%)	3 (75%)	4 (100%)	0.5	Modify question to "support from colleagues." No change was made as negatively worded items should be included. * #
Item 46: The purpose and implementation of reporting systems should be addressed clearly	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 47: More blame attached to those who report errors	0	0	1 (25%)	3 (75%)	4 (100%)	0.5	Removal of "more but less blame" No change was made as negatively worded items should be included. *
Item 48: Access to computer-based reporting systems from home	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 49: Education about the purpose of reporting.	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 50: Clear guidelines about what adverse events and errors to report	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 51: Training on how information should be reported	0	0	0	4 (100%)	4 (100%)	0	No changes *

Index of Content Validity							
Section/ Item	1=irrelevant	2=unable to assess relevance without item revision or item is in need of such revision that it would no longer be relevant	3= relevant but needs minor correction	4=extremely relevant	Items ranking 3 and 4	Median score for this item [correct all from excel]	Comments
Item 52: Information on how confidentiality will be maintained	0	0	0	4 (100%)	4 (100%)	0	No changes *
Item 53: No payment for time taken to report.	0	1 (25%)	1 (25 %)	2 (50%)	3 (75 %)	1	Modify question to "Incentives for time taken to report" This change was made. *
Total numbers of items with this score amongst 212 ratings (1, 2, 3, 4) of 53 items	0	1	19	192	211		
Median of items with this score (IQR)	Cannot be computed[+]	0 (0)	0 (1)	4 (1)	4 (0)		
Mean of items with this score (SD)	0 (0)	0.02 (0.137)	0.36 (0.710)	3.62 (0.740)	3.98 (0.137)		
Count: experts scoring between 3 and 4 = 52/53							
Count: all respondents where 1+2 =1 = 1/53							
Count: all respondents where 1+2 =2 = 0/53							

Appendix D:

Pilot study on (N=30) respondents showing responses to Section A-E of a 53 item questionnaire conducted over two time periods

No.	Item	Number (%)	Weighted Kappa Value	Z	P Value	95% CI	Comments
1	What is your age?	30 (100)	1.000	8.498	0.000	1.000 - 1.000	Item was retained
2	What is your gender?	30 (100)	1.000	5.477	0.000	1.000 - 1.000	Item was retained
3	What is your profession?	30 (100)	1.000	5.477	0.000	1.000 - 1.000	Item was retained
4	What is your professional qualification?	30 (100)	1.000	6.781	0.000	1.000 - 1.000	Item was retained
5	How many years of work experience have you?	30 (100)	1.000	8.338	0.000	1.000 - 1.000	Item was retained
6	What is your current work status?	30 (100)	1.000	7.375	0.000	1.000 - 1.000	Item was retained
7	This hospital has a system for reporting errors	30 (100)	0.915	6.504	0.000	0.792 - 1.037	Item was retained
8	I know where and when to report	30 (100)	1.000	7.678	0.000	1.000 - 1.000	Item was retained
9	I have never reported an incident or error I was involved in	30 (100)	0.730	5.887	0.000	0.488 - 0.973	Item was retained
10	I have reported an incident committed by a colleague	30 (100)**	0.619	4.960	0.000	0.352 - 0.885	Item was discarded
11	I do not know how to locate an incident form	30 (100)	0.765	6.325	0.000	0.550 - 0.979	Item was retained
12	I know what to do with a completed form	≠29 (96.7)**	0.631	4.815	0.000	0.386 – 0.877	Item was discarded
13	I do not know who to report an incidence or error to	≠29 (96.7)	0.822	6.301	0.000	0.665 – 0.979	Item was retained
14	Patient falls with resultant injury	30 (100)**	0.539	4.003	0.000	0.230 – 0.848	Item was discarded
15	Wrong drug prescribed and administered requiring treatment and prolong hospitalization	≠29 (96.7)	1.000	6.574	0.000	1.000 - 1.000	Item was retained
16	Patient received wrong treatment or procedure	≠29 (96.7)**	0.636	4.547	0.000	0.367 – 0.925	Item was discarded
17	Equipment fault resulting in patient harm	≠29 (96.7)	0.898	6.127	0.000	0.757 – 0.038	Item was retained
18	Serious error like delay in patients' treatment resulting in death	30 (100)	0.717	4.914	0.000	0.472 – 0.962	Item was retained
19	Communication error resulting in breach of patients' confidentiality	≠29 (96.7)	0.748	5.027	0.000	0.528 – 0.967	Item was retained

No.	Item	Number (%)	Weighted Kappa Value	Z	P Value	95% CI	Comments
20	Infection acquired during hospital stay	≠29 (96.7)	1.000	7.326	0.000	1.000 – 1.000	Item was retained
21	Pressure sore acquired during hospital care	30 (100)	0.678	5.070	0.000	0.462 – 0.894	Item was retained
22	Diagnostic errors that can cause serious disability or death	≠29 (96.7)	0.837	5.810	0.000	0.684 – 0.989	Item was retained
23	Haemolytic reaction due to the administration of ABO-incompatible blood or blood products	30 (100)	1.000	6.473	0.000	1.000 – 1.000	Item was retained
24	There is positive feedback when errors are reported	30 (100)	0.822	6.738	0.000	0.676 – 0.968	Item was retained
25	I am not afraid of any adverse consequences of making a report such as litigation	30 (100)	1.000	6.690	0.000	1.000 – 1.000	Item was retained
26	My colleagues will be unsupportive and cast blame on me	≠29 (96.7)	0.921	7.177	0.000	0.836 – 1.007	Item was retained
27	When an error occurs, much focus is on the individual without looking at organizational /system errors	30 (100)	0.856	6.775	0.000	0.721 – 0.990	Item was retained
28	My patient will lose trust in me and feel unsafe in my presence	≠29 (96.7)	0.973	6.941	0.000	0.919 – 1.028	Item was retained
29	The response by supervisors/administrators does not match the severity of the error	30 (100)	1.000	7.912	0.000	1.000 – 1.000	Item was retained
30	There is no point reporting an error that did not cause harm	≠29 (96.7)	1.000	7.627	0.000	1.000 – 1.000	Item was retained
31	Making a report is not time consuming	30 (100)	1.000	7.076	0.000	1.000 – 1.000	Item was retained
32	When I don't know whose responsibility it is to make a report	≠29 (96.7)	0.914	7.377	0.000	0.817 – 1.010	Item was retained
33	When I do not consider an incident to be an error	≠27 (90.0)	0.856	6.866	0.000	0.716 – 0.995	Item was retained
34	Error reporting system is not effective in my hospital	30 (100)	0.817	6.779	0.000	0.707 – 0.927	Item was retained
35	The form is easy to fill in	≠29 (96.7)	0.917	7.911	0.000	0.829 – 1.004	Item was retained
36	The task I engage in at work makes me remember to report an error	≠29 (96.7)	0.737	5.561	0.000	0.547 – 0.927	Item was retained
37	There is no confidentiality of errors reported	30 (100)	0.800	6.566	0.000	0.656 – 0.944	Item was retained
38	As long as the staff involved learn from incidents it is unnecessary to discuss them further	≠29 (96.7)	0.719	5.713	0.000	0.579 - - 0.860	Item was retained
39	Generalized feedback about reports received from the hospital reporting system	30 (100)	0.726	4.489	0.000	0.500 - -0952	Item was retained

No.	Item	Number (%)	Weighted Kappa Value	Z	P Value	95% CI	Comments
40	Individualized feedback to you about reports you submit	≠29 (96.7)	0.914	6.693	0.000	0.820 – 1.009	Item was retained
41	Role models e.g. senior colleagues, departmental directors who openly encourage reporting	30 (100)	0.741	6.247	0.000	0.564 – 0.918	Item was retained
42	Legislated protection of information provided from use in litigation	≠26 (86.7)	0.749	5.796	0.000	0.548 – 0.950	Item was retained
43	Anyone may report anonymously	30 (100)	0.757	6.339	0.000	0.596 – 0.918	Item was retained
44	Lack of access to paper forms for reporting	≠29 (96.7)**	0.461	4.129	0.000	0.212 – 0.710	Item was discarded
45	Lack of support from colleagues	30 (100)**	0.401	4.195	0.000	0.156 – 0.646	Item was discarded
46	The purpose and implementation of reporting systems should be addressed clearly	30 (100)	0.866	7.019	0.000	0.707 – 1.025	Item was retained
47	More blame attached to those who report errors	30 (100)	0.926	7.226	0.000	0.851 – 1.001	Item was retained
48	Access to computer-based reporting systems from home, phone, or hotline reporting	30 (100)	0.708	4.133	0.000	0.408 – 1.007	Item was retained
49	Education about the purpose of reporting	30 (100)	0.691	4.860	0.000	0.413 – 0.969	Item was retained
50	Clear guidelines about what adverse events and errors to report and who should report	≠29 (96.7)	0.715	4.411	0.000	0.482 – 0.948	Item was retained
51	Training on how information should be reported and what should be done with reports	30 (100)	0.691	4.909	0.000	0.445 – 0.936	Item was retained
52	Information on how confidentiality will be maintained if you supply your name	30 (100)	0.738	4.102	0.000	0.482 – 0.994	Item was retained
53	Incentive for time taken to report	30 (100)	0.788	5.886	0.000	0.676 – 0.899	Item was retained

Items removed from the final questionnaire following IRR

Item 10: I have reported an incident committed by a colleague

Item 12: I know what to do with a completed form

Item 14: Patient falls with resultant injury

Item 16: Patient received wrong treatment or procedure

Item 44: Lack of access to paper forms for reporting

Item 45: Lack of support from colleagues

Appendix E:

Negatively-worded questions re-coded

I have never reported an incident or error I was involved in (Q9)

I do not know how to locate an incident form (Q10)

I do not know who to report an incidence or error to (Q11)

There is positive feedback when errors are reported (Q20)

I am not afraid of any adverse consequences of making a report such as litigation (Q21)

Making a report is not time consuming (Q27)

The form is easy to fill in (Q31)

The task I engage in at work makes me remember to report an error (Q32)

As long as the staff involved learn from incidents it is unnecessary to discuss them further (Q34)

More blame is attached to those who report errors (Q41)

Appendix F:

UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee

Room E53-46 Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [021] 406 6492
Email: sumayah.ariefdien@uct.ac.za
Website: www.health.uct.ac.za/fhs/research/humanethics/forms

05 October 2016

HREC REF: 675/2016

Dr U Kyriacos
Division of Nursing
Health & Rehab Sciences
F-56 OMB

Dear Dr Kyriacos

PROJECT TITLE: SELF-REPORTED PERCEPTIONS OF FACTORS INFLUENCING ERROR REPORTING IN A NIGERIAN HOSPITAL: A CROSS SECTIONAL STUDY (MSc-candidate-A Olamide)

Thank you for submitting your study to the Faculty of Health Sciences Human Research Ethics Committee (HREC) for review.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

Approval is granted for one year until the 30 October 2017.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.
(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

Please quote the HREC REF in all your correspondence.

We acknowledge that the student, A Olamide will also be involved in this study.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please note that for all studies approved by the HREC, the principal investigator **must** obtain appropriate institutional approval before the research may occur.

Yours sincerely

Signed

PROFESSOR M BLOCKMAN
CHAIRPERSON, FHS HUMAN RESEARCH ETHICS COMMITTEE

Federal Wide Assurance Number: FWA00001637.
Institutional Review Board (IRB) number: IRB00001938

HREC 675/2016

Appendix G:

FEDERAL TEACHING HOSPITAL
IDO-EKITI
P.M.B. 201, IDO-EKITI. Tel: 030-251723, 251110

Our Ref:..... Your Ref:..... Date:.....

ETHICS AND RESEARCH COMMITTEE, FEDERAL TEACHING HOSPITAL, IDO-EKITI

CLEARANCE CERTIFICATE

PROTOCOL NUMBER: ERC/2016/11/08/61B

PROJECT TITLE: SELF-REPORTED PERCEPTIONS OF FACTORS INFLUENCING ERROR REPORTING IN A NIGERIAN HOSPITAL: A DESCRIPTIVE CROSS-SECTIONAL STUDY

PRINCIPAL INVESTIGATOR(S): AFOLALU OLAMIDE OLAJUMOKE

DEPT/INSTITUTION: Division of Nursing and Midwifery, Faculty of Health Sciences,- University of Cape town, South Africa

DATE CONSIDERED: 29 /11/2016 **DECISION OF COMMITTEE**: APPROVED

CHAIRMAN, RESEARCH AND ETHICS COMMITTEE: Dr Durowade K. A.

SIGNATURE.... Signed ... DATE. 29- 11- 2016

DECLARATION BY INVESTIGATOR(S)

PROTOCOL NUMBER:(Please quote in all enquiries/correspondence) ERC/2016/11/08/61B

To be completed in three copies and returned to the Secretary, Ethics and Research Committee of Federal Teaching Hospital, Ido-Ekiti, Ekiti State, Nigeria.

I/ We fully understand the conditions under which I am/we are authorized to conduct the above mentioned research and I/ we guarantee that I/we will ensure compliance with these conditions. Should any changes or departure be contemplated from the research procedure as approved, I/we undertake to re-submit the protocol to the Ethics and Research Committee for consideration and approval.

NB: The Committee reserves the right to conduct compliance visit(s) to your research site(s) without prior notification.

Signature(s). Signed Date 08/12/2016

Phone Number 08060122916/08034822573 E-mail Address. afolalulamide@hotmail.com

Appendix H:

Specialist Hospital Osogbo Health Research Ethics Committee (SHOHREC)

Promoting Highest Ethical and Scientific Standards for Health Research.

Our Ref: HREC/27/04/2015/SSHO/028 Your Ref:..... Date: 17/01/2017

NOTICE OF FULL APPROVAL AFTER FULL COMMITTEE REVIEW

RE: SELF-REPORTED PERCEPTIONS OF FACTORS INFLUENCING ERROR REPORTING IN A NIGERIAN HOSPITAL: A DESCRIPTIVE CROSS-SECTIONAL STUDY.

Health Research Committee assigned number: HREC/27/04/2015/SSHO/028

Name of Principal Investigator: MRS AFOLALU OLAMIDE OLAJUMOKE

Address of Principal Investigator: DIVISION OF NURSING AND MIDWIFERY, DEPARTMENT OF HEALTH & REHABILITATION SCIENCES, FACULTY OF HEALTH SCIENCES, UNIVERSITY OF CAPE TOWN, SOUTH AFRICA.

Date of receipt of valid application: 10th of January, 2017.

This is to inform you that the research described in the submitted protocol, the consent forms, advertisements and other participant information materials have been reviewed and *given full approval by the Health Research Ethics Committee.*

This approval dates from 17/01/2017 to 17/12/2017. If there is delay in starting the research, please inform the HREC so that the dates of approval can be adjusted accordingly. Note that no participant accrual or activity related to this research may be conducted outside of these dates. *All informed consent forms used in this study must carry the HREC assigned number and duration of HREC approval of the study.* In multiyear research, endeavor to submit your annual report to the HREC early in order to obtain renewal of your approval and avoid disruption of your research.

The National Code for Health Research Ethics requires you to comply with all institutional guidelines, rules and regulations and with the tenets of the Code including ensuring that all adverse events are reported promptly to the HREC. No changes are permitted in the research without prior approval by the HREC except in circumstances outlined in the Code. The HREC reserves the right to conduct compliance visit your research site without previous notification.

Signed

Dr. Ola Ibigbami,
Chairman,
Health Research Ethics Committee
State Specialist Hospital
Osogbo, Osun State.
Nigeria.

C/O The Secretary, Administrative Department,
State Specialist Hospital, Asubiaro, Osogbo,
Osun State. Nigeria.

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